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DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL

Pigs on pasture,
Boonah District,
South-eastern Queensland.

LEADING FEATURES

Land Utilisation and Conservation
Progressive Farmers of the Gympie District
The Beef Cattle Industry in the Far West
Topical Notes on Pest Control
Points in Dairy Practice
Pig Carcass Competitions
Control of Worm Parasites of Sheep

Edited by
C. W. WINDERS, B.Sc.Agr.

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Volume 67 Part 1

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
C. W. WINDERS, B.Sc.Agr.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Retirement of R. E. Soutter.

A NOTEWORTHY event during June was the retirement, under the retiring age regulations, of Mr. R. E. Soutter, after fifty years of service in the Department of Agriculture and Stock, a period of service during which, after the early years of tedious endeavour, achievement followed achievement. The impressive tributes paid to his plant-breeding work by the Minister for Agriculture and Stock (Hon. H. H. Collins), the Under Secretary (Mr. A. F. Bell), grain producers' organisations, and flour millers testify to its worth, which is reflected in the conspicuous part played by Soutter-bred wheats in the Queensland wheat-growing, flour-milling, and baking industries.

Mr. Soutter joined the Government service in 1898, his first appointment being as a horticulturist at the State Farm at Westbrook, near Toowoomba. He was subsequently placed in charge of wheat demonstration plots in the Maranoa, and in 1906 was appointed manager of the Roma State Farm, situated at Bungeworgorai. His main assignments were to demonstrate the new methods of dry farming in the Maranoa and to improve the rust resistance of the wheats then commonly grown.

At first the wheat improvement work was subsidiary to the elaboration of suitable farming methods for the district, but as the crossing and selection work began to show results more and more time was devoted to wheat breeding. The first of the Soutter-bred wheats to come

into commercial production at the expense of the older varieties was Flora. As an illustration of the time and patience required in establishing a new commercial variety, it might be mentioned that the original cross which gave the variety Flora was made between Bobs and Florence in 1911. It was eventually selected as a variety in 1919 and named in 1923. In the 1928-29 season Flora contributed only 20 acres to the State's wheat planting; by 1939-40 it was grown on over 55,000 acres.

With a large number of commercial varieties to his credit, Mr. Soutter was transferred to Brisbane in 1935 so that he could extend his breeding and testing work in the main wheatgrowing areas. In recent years wheats bred by him have comprised eight of the first ten varieties in order of importance, and have yielded two-thirds of the Queensland wheat crop. The popularity of the Queensland-bred varieties lies in their relative resistance to rust infestation combined with high yielding capacity and excellent milling quality.

The wheats produced by Mr. Soutter are a monument to his genius as a plant breeder. The affection felt for him by all who have been associated with him is a tribute to his sterling personal characteristics.

Services to the Woolgrower.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has expressed pleasure at the way in which sheep raisers had responded to the efforts of the field officers of the Sheep and Wool Branch within the Department's Division of Animal Industry. He revealed that several branches of the Graziers' Association have written appreciative letters to the Department praising the service these officers were giving the industry.

Mr. Collins pointed out that during the last financial year 235 demonstration days had been held on sheep properties by the Advisers in Sheep and Wool. Most aspects of preventable economic loss had been covered, and property owners usually arranged for their neighbours to be present when demonstrations were in progress so that they could acquaint themselves with the most modern methods being used to overcome some of the problems facing woolgrowers.

In addition, said Mr. Collins, eleven large-scale field days were conducted, which were attended by more than 700 sheep men. The field days aimed at covering wider aspects of animal production, and this was an important phase in the development of the industry.

As part of its policy of providing an adequately trained staff of field advisers to assist woolgrowers throughout the State, the Agriculture Department has arranged for one of its junior officers to spend a year at Clonagh sheep station, in the Cloncurry district, to gain first-hand practical experience in sheep property management.

The Minister has announced that the officer chosen is Mr. W. J. Fielding, an ex-serviceman with a stock diploma from Gatton College, who has been gaining experience in wool classing and handling in the Department's Farmers' Wool Scheme. The special field training has been arranged through the courtesy of the Scottish-Australian Company, and Mr. W. Armstrong, manager of Clonagh.

Land Utilisation and Conservation.

A. F. SKINNER, Soil Conservationist.*

PROBLEMS of land utilisation and conservation are receiving at the present time more thought and attention by the nations of the world than ever before. The reason for this probably lies in the fact that under present systems of use the land resources of the world are not only inadequate to feed and clothe the present population but, if taken overall, are actually declining in productivity as a result of misuse and erosion.

History has taught two lessons: Firstly, nature's land resources cannot be ruthlessly exploited without being destroyed; secondly, nations that destroy their soil destroy themselves. Indeed, it has been said that the story of civilisation is the story of man's conquest, exploitation, and devastation of land.

Death of the land denotes the extreme and final stage in a definite sequence of events which commence with the removal of nature's protective mantle of vegetation from the surface of the soil. The effects of erosion are cumulative, and therefore the rate at which the process occurs progressively accelerates as the condition of the land deteriorates.

Importance of the Topsoil.

All forms of plant life, whether cultivated crops, pasture grasses, or forest trees, serve to break the direct impact of raindrops on the soil, while plant roots anchor the soil firmly in place. Dead plant litter on the ground further protects the surface of the soil and serves to hold the water temporarily in millions of tiny dams, allowing it to soak down into the spongy mass. Portion of this water later reappears at lower levels as springs, which feed the streams and keep them flowing throughout the year.

If precautions are not taken when the land is stripped of its vegetative cover much of the water that would have soaked into the soil will run to waste, carrying with it a load of the most valuable part of the soil, the topsoil. It is in this topsoil, each inch of which has probably taken from 500 to 1,000 years to build, that most of the food material for plants is stored. Most of the humus and plant food in any soil is usually within the top 6 or 8 inches. Soil rich in humus is a good home for the teeming millions of tiny micro-organisms, for earthworms,

* In an Australian Broadcasting Commission "Country Hour" talk.

and for other forms of life, all of which are important in making soil sweet and fertile. The hard and non-fertile subsoil has little nutrient to offer plants, and farming on eroded land is usually difficult and costly, with profits diminishing and ultimately disappearing altogether.

As the erosion process continues, the fertility of the soil declines and its power to absorb water also decreases. The percentage of water that runs off becomes progressively higher, with a corresponding increase in the amount of soil also lost. This increased amount of run-off water tends to add to the size of floods in the valleys and to cause damage in many ways. The soil washed from the hills is usually deposited in the beds of the streams, and in time may choke them completely or may gradually fill large reservoirs with useless silt. This is now a very serious problem in many parts of the world.

Because much of the water runs off the land instead of soaking in to feed the springs, streams will often cease to flow. Drought conditions appear to recur more frequently and to be more severe for the same reason. As each stage or condition develops the land becomes more and more susceptible to erosion, and thus the rate of damage accelerates.

During the early stages changes occur so gradually that erosion is seldom suspected as the cause, the usual conclusion being that the seasons have changed or that the soil is worn out.

Proper Use of Land.

The fundamental principle on which modern conservation practices are based is embodied in the creed of the American Soil Conservation Service, which is—"Use every acre for the purpose for which it is best suited and treat it according to its needs."

Land use capability—or, in other words, its suitability for a certain type of use—is governed by such factors as topographical relief and soil type, while the treatment needed for its protection will depend upon its condition and its susceptibility to run-off and erosion.

For example, land of very slight gradient can usually be cultivated with safety without the need for special protective measures. Slightly steeper land, whilst, perhaps, still suitable for cultivation, may require the use of some special protective measures, such as wider crop and pasture rotations, stubble mulching, or a system of contour tillage. Other land, such as on foothill slopes, may call for the use of still more intensive conservation practices, such as graded banks, grassed waterways, and so on, or may be suitable for use only as pasture land.

Extremely steep slopes, stony land, or land that is for any reason particularly vulnerable to erosion can often be used to best advantage if managed as a farm forestry area.

Control of Run-off.

The planning of land use also calls for special attention to the disposal of surplus run-off water. Care should be taken to preserve and protect the natural drainage system. Very often the main depressions, or storm watercourses, are ignored when land is being broken up and they are either ploughed up, used as laneways, or exposed to concentrated grazing. Under such conditions they are likely to erode severely and lead to the formation of gullies.

Every effort should be made to reduce the amount of water lost from the land as run-off to an absolute minimum. On cultivated land this can be achieved by the use of sound cultural practices, stubble mulching, and contour tillage; on grazing and forest land, by careful management of pastures, the control of fires and the construction of farm tanks and dams at strategic points along drainage lines.

As far as possible the general design of the farm layout should conform to the contours of the landscape. By this it is meant that fence lines and roads should follow, as closely as possible, a level line, or contour, or should cross the contours at right angles. In this connection it is mentioned that the orthodox square system of farm layout fits the topography of the landscape only when the land is level, but that is not often the case.

Loss of soil is, however, not the only factor of importance. The importance of actual loss of water which escapes from the land as run-off is very often overlooked, and to suggest that a person is farming on a 30-inch rainfall, for example, merely because his property is located in a 30-inch rainfall area, would be far from actual fact in most cases.

This point was very well illustrated by the Soil Conservator of South Australia (Mr. R. Herriott) in a recent broadcast talk, and his summary of the position as it applies in that State may be quoted. "The unnecessary loss of 45 points of rain water from a 100-acre fallowed paddock means that you have lost not only a million gallons of water but also 29 tons of soil, 100 bushels of wheat, the equivalent of 3 cwt. of superphosphate, the equivalent of 1½ cwt. of sulphate of ammonia, and 1/2,000 of your total topsoil. All this happened when there was no need for it."

Education in Conservation.

Moves are now being made in all States of Australia to ensure the better use of our soil, forest, and water resources and to encourage the extensive use of soil conserving agricultural and pastoral practices. In Queensland a number of Government departments have separately and co-operatively conducted various initial investigations and educational phases of the work.

With profits to the farmer at one end and savings to the State at the other, soil conservation is not only economically sound but is the only permanent basis on which the future security and prosperity of this or any other country can be guaranteed.

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The COUNTRY HOUR, a special service for farmers, is broadcast DAILY through the National and Regional Stations from 12 to 1.

Progressive Farmers of the Gympie District.

[During a recent visit to the Gympie district, the Minister for Agriculture and Stock (Hon. H. H. Collins) was shown over some of the progressive farms, and expressed his pleasure at the advanced methods of agriculture and dairying adopted. The following notes on some of the properties visited have been supplied by the Minister for publication.—Ed.]

Fruit Production.

LAST summer's crop of pineapples in the Gympie–Mary Valley area amounted to 250,000 cases, and it is estimated that the total yield for the summer, intermediate and winter crops will be in the vicinity of 400,000 cases. Bananas and papaws are other important fruit crops in the district.

On the "Red Slopes" property at Goomboorian, farmed by Messrs. W. N. and A. E. Buchanan, a range of horticultural crops is being grown and irrigation is being judiciously used to stabilise production. Water is pumped mainly from Tinana Creek and is held in two large concrete tanks in an elevated position, from which it gravitates to spray lines or to irrigation channels. Pumping is also carried out from wells as required. Irrigation has been practised on this farm since 1942 and is applied to papaws, beans, and other crops.

The total area under crop on "Red Slopes" is 40 acres, including 12 acres each of pineapples and papaws and 10 acres of beans. The average per acre production of beans is over 100 cases. Last year the 12 acres of pineapples yielded 1,300 cases and a similar area of papaws produced over 6,000 cases, much of which went to the Sydney market.

Plate 1.

VIEW OF WEIR, UNDERSHOT WATER WHEEL AND CENTRIFUGAL PUMP SERVING MR. J. A. REIBEL'S FARM AT SEXTON.

Pleasing features of this farm were the scientific methods of production, the organised method of working and the planned marketing of the crops.

An inspection was also made of a large pineapple plantation at Amamoor, a 100-acre planting belonging to Messrs. Sanders Bros. Here large-scale cultivation methods were examined and the packing shed set-up inspected.

At Gympie, fruit ripening and vegetable cooling rooms, some operating, others under construction, provided pleasing evidence of advanced methods of catering for the consumer of farm products.

Progressive Dairymen.

On his farm at Sexton, 16 miles north of Gympie, Mr. J. A. Reibel has devised an irrigation system which he finds invaluable in the production of lucerne from his 40 acres of cultivation.

The irrigation plant consists of an undershot water wheel, which drives a centrifugal pump that lifts the water about 50 feet and gives sufficient pressure to operate a 37-nozzle spray line up to half-a-mile away. Water is diverted to the undershot wheel by a low rock weir on the river. The wheel itself consists of 13 tons of steel rotated on an 8-inch steel axle (see Plate 1). Apart from an occasional lubrication, the pumping plant runs virtually unattended. Though it is not protected against flood damage, the pumping outfit has suffered only slightly in the 17 floods that have been over it.

Lucerne grown on the farm is stored in a high barn into which the 2-ton hay truck can be driven directly.

Great interest was taken in the dairy farm of Mr. Arthur Walker at the Dawn. This farm has long been a model dairy farm, with paddocks well subdivided and laid out for most efficient grazing. A cultivation area of 70 acres provides most of the off-season feed requirements of the dairy cattle and pigs. The main crops grown are oats and grain sorghum.

CHANGE OF ADDRESS.

Changes of address should be notified at least fourteen days before the date of issue with which the change is to take effect. The former address should be given as well as the full Christian names and surname of the subscriber.

Address all communications to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Retirement of Mr. J. F. F. Reid.

MR. J. F. F. REID retired from the Department of Agriculture and Stock on 30th June, after twenty-seven years' continuous service as Editor of Publications.

Plate 2.
MR. J. F. F. REID.

Mr. Reid was born in Sydney and started his working life in a barrister's chambers. He left law for the land, and after completing the Sheep and Wool course at Sydney Technical College went into the pastoral industry in western Queensland, where he remained for some years. When agricultural lands in the South Burnett were opened for closer settlement, he was among the first selectors and acquired both scrub and forest country. As the district developed he became actively associated with the country Press, and as a newspaper editor gained a high reputation for his vigorous advocacy of rural interests.

On the outbreak of the 1914-1918 war Mr. Reid enlisted for active service with the A.I.F., in which he gained commissioned rank. At the end of the war he was appointed to H.Q., London, as a conducting officer with parties of A.I.F. farmers and graziers on educational tours throughout the United Kingdom and Ireland. He also travelled extensively in Europe. His experiences on all these tours were subsequently published as "Stud Stock Studies" (London, 1919) and "Rural Life in Other Lands." In the 1939-1945 war he served as a Staff Captain with the Volunteer Defence Corps.

Mr. Reid took an active part in the organisation of the Queensland Producers' Association. When radio was developed to the public utility stage, he organised a system of regular agricultural talks in association with the management of Station 4QG. He was chosen to speak for Queensland in the first Empire Broadcast. For many years he conducted the A.B.C. *Countryman's Session* and, more recently, *The Country News Magazine*. During the war he conducted the radio publicity section of the food production campaign in liaison with Commonwealth Food Control.

Mr. Reid has been a special lecturer on journalism at the University of Queensland, was a foundation member of the Queensland Authors' and Artists' Association, and is a member of the John Oxley Library Committee and of Brisbane Legacy. Interested in local Government, Mr. Reid was a councillor of the Balmoral Shire until its absorption in the Greater Brisbane Area.

In his younger days Mr. Reid represented his district in Rugby Union football. As a member of the Royal Queensland Yacht Club he has sailed with a representative Queensland crew for the Australian yachting title on the waters of every State in the Commonwealth.

At a farewell function the Minister for Agriculture and Stock (Mr. H. H. Collins) spoke in eulogistic terms of Mr. Reid's sterling contributions to the education of Queensland farmers, and was supported by the Department's Under Secretary (Mr. A. F. Bell), who mentioned that Mr. Reid had kept the Department's monthly journal and its various advisory pamphlets in line with modern educational methods.

CATTLE HUSBANDRY

The Beef Cattle Industry in the Far West.

J. C. J. MAUNDER, Chief Inspector of Stock.

THE methods of raising beef cattle in the channel and off-channel country of the Georgina (Eyre Creek) and Diamantina rivers in western Queensland were the subject of an investigation by the author and Mr. S. C. Smith (District Inspector of Stock, Longreach) in July, 1947.

The prevailing pastoral conditions were dry, no floods having occurred in either river during the season and less than 3 inches of local rain having fallen over the area during the previous six months.

The route covered, travelling by car, was from Winton to Boulia, down the Georgina to a point just north of Birdsville and down the Diamantina to Durrie; west of Bedourie to Sandringham, and traversing typical "off-channel" country between the two rivers. This represented coverage of an approximate area of 50,000 square miles.

THE CHANNEL COUNTRY.

Channel Formation.

The outstanding feature of the area is the natural system of reticulated irrigation that is provided by the channels or de-tributaries that break off from the main channels of the rivers. These channels become shallower as they get further from the main channel and continue to branch and form additional off-channels. Some disperse fully while others may eventually rejoin the main channel.

The extent of flood water dispersal depends upon the height of the flood in the main river. A small flood in the river will result in a dispersal of water into the minor channels, while increasing height of the flood will result in further dispersal of waters into the "swamps" and finally over the flood plains. Flood waters recede from the flood plains after a period of inundation which may vary from a few days up to a couple of weeks. The water recedes from the channels more slowly and in the "swampy" areas may not disappear for a month or more.

A channel may disperse over a wide area of low-lying "swampy" country that, when flooded, will form an inland "lake." Such a lake would be "ponded" by low sand hills, and may be as large as 100 square miles in extent; Lake Machattie on the Georgina watershed is an example of this formation.

Soils of the Channels.

The soils of the channels and "swampy" areas are of heavy grey clay and contract greatly during dry periods between floods, forming very extensive cracks. These soils are very fertile and there is comparatively little leaching of plant nutrients to depths beyond the reach of plant roots. The surfaces are extremely rough and almost impossible to negotiate by motor vehicle.

Vegetation of the Channels.

Typical of the channels and swampy areas is the domination by blue bush (*Chenopodium auricomum*) and lignum (*Muehlenbeckia cunninghamii*). The limits of blue bush almost coincide with the flood water distribution of "channel floods" and demarcates that area of so-called "swampy country" in which the only feed produced is in response to flooding. Local rains produce no feed in the channels (see Plate 3). The lignum stands are in those parts of the channels in which the water may lie on the ground for a considerable time (Plate 4).

Plate 3.

BARE BLUE BUSH IN AN OFF-CHANNEL OF THE DIAMANTINA.—Note the complete absence of vegetation in the intervening spaces, and the large surface cracks of the heavy grey clay. Local rains will not produce feed in these channels; flood water only will do that.

Plate 4.

TYPICAL LIGNUM SWAMP FED BY CHANNELS OF THE GEORGINA.—The tall dark lignum bushes stand out plainly. The intervening spaces are dominated by dry native sorghum and cane grass. The marked shallow depression carries the very valuable "clover" feed, which appears as the water gradually recedes from the shallow channels.

Blue bush has some feed value but lignum is inferior as a stock feed. The valuable fattening feed of the channels consist of the so-called native sorghum (*Echinochloa turneriana*), neverfail (*Eragrostis setifolia*), pepper grass (*Panicum whitei*), channel blue grass, some Flinders grass (*Iseilema membranacea*) and a variety of good herbage. In the Georgina channels, "clover" (*Trigonella suavissima*) and native sorghum are the dominant channel feeds, but no clover whatever grows in the Diamantina channels. A coarse cane grass (*Eragrostis australasica*) of the channels grows with the lignum-sorghum communities, but it is of little feed value (Plate 4).

The native sorghum (actually it is not a true sorghum and does not form prussic acid) is the outstanding grass of the channel country and is a summer-growing annual. It comes away quickly after flood waters recede and grows vigorously to well above saddle height. It is of greatest value in the green stages, cattle showing decreasing liking for this grass as it dries off. Extensive flats, commonly 2–3 miles across, in good flood seasons are a vast sorghum field (Plate 5). In the earlier days, sorghum hay was made and stacked for hand-feeding to stud cattle, and there is no doubt it would make a very useful hay. The sorghum matures in a few months and seeds very heavily, the seeds finding shelter in the deep cracks that begin to open in the grey clay as the season dries out.

Plate 5.

View from the Top of a Sandhill, Looking Across a Native Sorghum Flat which Extends to the Distant Sandhill in the Background.—Note the timber fringed waterhole and the channels branching out as indicated by the lighter timber lines. These channels are flooded from the Diamantina, the main channel of which would be approximately six miles from this point. At the foot of this sandhill were found the old winches which were used in the 1890s for constructing sorghum stacks.

With summer floods, the feed response is more marked with sorghum and the other grasses, whereas in later floods, March or April, the herbage response is much greater and more extensive than with summer floods. This is particularly the case with the clover of the Georgina.

The dominating timbers are coolibah (*Eucalyptus coolabah*) and gidgea (*Acacia cambagei*), which occur mainly as thin fringing belts along the channels.

THE FLOOD PLAINS.

Merging with and beyond the limits of the heavier "swampy" channel country which carries the lignum, blue bush, sorghum and clover, extend the level flood plains over which the flood waters disperse from the channels. Normally these plains are only submerged for a few days, which is sufficient time to soak the ground thoroughly, and flooding is followed by a good feed response. These flood plains vary from a mile or two up to several miles across, and the limits are in most cases marked by sandhills or low sand ridges (Plate 6).

Plate 6.

THESE CATTLE ARE WALKING BACK FROM WATER AND ARE ON THE FRINGE OF CHANNEL AND FLOOD PLAINS.—Note the tussocks of dried-out blue bush, denoting the fringe of the heavier channel soil as it merges with the lighter plain. The spaces between the tussocks are carrying a light covering of Flinders and button grasses.

Soil of the Flood Plains.

The soil generally is a reddish-grey loam, sometimes lightly covered with gravel and pebbles. Fine silt deposits occur from the periodical floodings. In the upper reaches of the Georgina and the Diamantina, these flood plains are not very extensive and quickly give way to the gravelly and pebbly downs and stony ridges. In lower reaches they are much more extensive, and as they get further from the main river channels gradually merge into the non-flooded gravelly downs and sandhill country.

Vegetation of the Flood Plains.

Unlike that of the heavier channel and "swampy" country, the vegetation of the flood plains will respond well to local rains in addition to flood response.

Button grass (*Dactyloctenium radulans*) and Flinders grass are the dominant species and constitute very valuable fattening feeds. Neverfail is also an important grass of the flood plain.

A wide variety of herbage comes away with winter rains, forming excellent feed.

There is no clover or native sorghum on these plains, nor is there any timber.

GRAVELLY DOWNS.

Beyond the limits of the flooded country extend the gravelly and pebbly downs areas that constitute the bulk of the country between the two rivers. The extent of these non-flooded downs would exceed the combined areas of channel country and flood plains. Between the upper reaches of the two rivers the gravelly and pebbly downs are more extensive than in the lower reaches, where they are inter-mingled with sandhill formations.

Plate 7.

Typical Stony Extreme of Gravelly Downs West of the Georgina.—Stretches of this extremely stony downs formation may be very extensive, extending to the horizon of low stony hills. Large areas are quite devoid of plant growth, which is confined to the small bare patches between the stones and to the small gullies, depressions, and well-worn cattle pads.

Soils of the Gravelly Downs.

The soils of the gravelly downs consist of yellowish-brown to light-red clay with which is invariably associated a covering of gravel or pebbles. These may vary from a coarse gravel to large pebbles up to boulders as big as a man's head. Generally speaking, these downs are more stony between the Georgina and Mulligan Rivers (Plate 7) than between the Georgina and Diamantina, where the smaller pebbles and finer gravelly downs predominate.

Bare claypans do occur, though not frequently, nor as a rule are they extensive. One claypan traversed, however, was approximately 15 miles by 6 miles. The soils of these claypans are usually silty in nature, almost impervious to water and present a smooth, almost polished surface.

Vegetation of the Gravelly Downs.

The most important vegetation is undoubtedly Flinders grass and button grass, which, even in the dry state, where it forms a mere powdery, lick-up feed, will still fatten cattle. On some parts of the gravelly downs, between the upper reaches of the Georgina and Diamantina, there are relics of Mitchell grass tussocks, which indicate some deterioration of the country. It would appear that, up to 20 years ago, Mitchell grass was the most important feed in this country; in fact, on some properties old and discarded hay-making equipment remains as evidence of past practices of mowing the Mitchell grass and stacking as hay.

There is a light cover of neverfail, and with winter rains a profuse growth of edible herbage is stimulated. The gravelly downs are practically devoid of timber.

The area between the Georgina and Diamantina immediately south-east of Boulia comprises approximately 6,000 square miles of gravelly downs country, with practically no channel or flooded country. In past years this area turned off splendid fats but now has a much reduced stocking rate, due to a large extent to the disappearance of Mitchell grass from the pastures.

SANDHILL COUNTRY.

The intensely interesting sandhill country forming the eastern fringe of the Simpson Desert is an outstanding feature of the lower reaches of the Georgina and Diamantina and the country between these rivers in that area. From Mooraberrie to Monkira, to Cluny and Bedourie, one traverses the heart of this sandhill country. A few miles west of Bedourie the sandhills gradually give way to the harder, pebbly downs and stony ridges.

Sandhill Structure.

The sandhills vary in height from low sand ridges, with very little loose sand at their summit, to imposing sandhills up to 100 ft. in height, composed of loose sand that is constantly blowing in eddies and drifts, and the summits of which are entirely bare of vegetation (Plate 8).

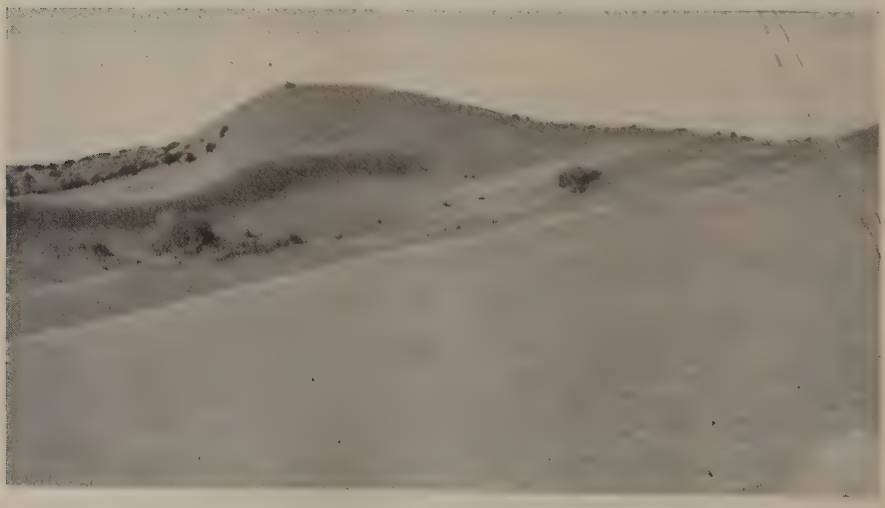


Plate 8.

LARGE SANDHILL IN THE HEART OF THE SANDHILL COUNTRY BETWEEN MONKIRA AND CLUNY.—From the bare summits, sand constantly blows in eddies and drifts. In many cases the sand blows, but is not removed from the formation, simply eddying around and finally lodging on the sides or in the depressions of the sandhill.

The sandhill formations generally have a direction from south to north and one "range" may run for several miles without a break. The distance between one "range" or line of sandhills and the next varies from ½-mile up to several miles.

In the heart of the best sandhill country, the area really comprises a series of flooded flats ½ to 1 mile in extent, divided from each other by lines of sandhills. These flats may flood from creeks which meander through the sandhill country, fed by local rains, and may also flood from typical channels which are the final de-tributaries from the main river channel.

As the sandhill ranges extend beyond the limit of channel floods they are separated from each other by wider stretches of downs country several miles in extent. Here, within a few hundred yards of the base, there is a light cover of sand drift, blown from the summits.

Vegetation of the Sandhill Country.

The lower sandhill ridges are covered right up to the summit with vegetation, consisting mainly of spinifex clumps and canegrass.

The higher sandhills carry an interesting gradation of vegetation. A flood plain may extend right to the foot of the slopes, carrying the usual cover of Flinders and button grass. On the slopes themselves, scattered, stunted trees of mulga and gidgea are to be seen. There is a considerable growth of herbage, including tahvine and a plant which resembles a giant pigweed. Generally speaking, the herbage is of less value as a stock feed than that which is to be found on the gravelly downs and flood plains. Spinifex (*Triodia basedowii*) and canegrass (*Spinifex paradoxus*) dominate the vegetative cover as the summit is approached. There is no doubt that stock can be maintained on the slopes of these sandhills in drought times, when all feed is exhausted on the flood and plain country.

Beyond the limits of the flooded country, there is sometimes a considerable cover of timber and excellent feed right to the base of the sandhills. The timber is generally a mixture of somewhat stunted mulga (*Acacia aneura*) and gidgea, while whitewood (*Atalaya hemiglauca*) and bauhinia (*Bauhinia carronii*) are fairly common.

The only stand of Mitchell grass seen in the whole of the Georgina-Diamantina country was in a stretch of country along the fringe of some sandhill slopes between Monkira and Cluny. This was on non-flooded country and was mixed with an excellent growth of Flinders and button grasses. Subsequently, it was ascertained that this particular area (Plate 9) had not been stocked for nearly 18 months.

Waterholes in the Sandhill Country.

Not the least remarkable aspect of this sandhill country is the prevalence of permanent waterholes, mainly along the courses of creeks which rise in the sandhills and meander ultimately to the main channels of the Georgina or the Diamantina.

Some of the creeks are fed entirely by run-off from local rains while some receive water from bores or bore drains. They may flood and contribute to the waters that submerge flood plains, sometimes independently and sometimes concurrently with channel floods. Their main

importance, however, lies in the fact that they form many excellent permanent waterholes in the sandhill country (Plate 10). From the distribution of these waterholes, it would appear that drought losses in this type of country are seldom due to lack of water, but purely to lack of feed.

Plate 9.

AN EXCELLENT STAND OF MITCHELL, FLINDERS, AND BUTTON GRASSES ALONG THE FRINGE OF THE SANDHILL SLOPES, BETWEEN MONKIRA AND CLUNY.—This is non-flooded country; less than 3 inches of rain had fallen during the current season (January-July), but this portion of the run had not been stocked for nearly 18 months. Timber is mainly on ridges.

Plate 10.

A TYPICAL WATERHOLE ALONG THE COURSE OF A CREEK IN THE SANDHILL COUNTRY, DIAMANTINA WATERSHED.—The banks of this hole are fringed with coolibah. A valuable feature is the firm banks; they are somewhat sandy and even in drought times do not become boggy.

GENERAL REMARKS ON GEORGINA AND DIAMANTINA COUNTRY.

To one travelling through, the channel country of the two rivers and the flood plains are very similar and carry much the same vegetative cover. The significant difference in vegetation is the fact that "clover" grows in the channels of the Georgina but not of the Diamantina.

The "between rivers" or "off channel" country in the upper reaches is composed of gravelly or pebbly downs. In the lower reaches is the heart of the sandhill country. The general opinion of men with experience of both rivers appears to favour the Diamantina country as being better fattening country than the Georgina.

The flood frequency of the Diamantina is certainly better than that of the Georgina.

CLIMATIC CONDITIONS.

The significant feature of the rainfall figures is the low rainfall throughout the area, with a slightly higher average in the Diamantina country than the Georgina, an average of 9·97 against 6·75 in favour of the Diamantina.

Examination of the average monthly distribution reveals the fact that about half the year's rainfall falls in the first quarter, and the bulk of that in January and February. From March to September very little rain can be expected; what does fall is usually in the form of light showers and these may come in any month. During the last quarter, light but useful rains may be expected, and these are most likely to fall in November and December.

Obviously, the driest part of the year, when no useful falls can be expected, is in the third quarter, July-September.

Records were not obtained showing flood frequency in the Georgina, but information gathered indicates that an effective flood, providing useful channel feed, cannot be expected more than one year in four.

On the other hand, records of Diamantina floods indicate an effective flood every second year. No doubt, this is partly accounted for by the fact that the catchment of the upper reaches of the Diamantina is situated in areas of higher rainfall than is the catchment of the upper reaches of the Georgina.

Owing to the fact that most holdings have country which benefits both from channel floods and from local rains, periods of severe drought losses are not frequent. There have been occasions on which absence of channel floods has been compensated to some extent by useful local rains, and vice versa. However, when there is absence of both over two seasons, then disaster follows.

LAND TENURE.

Duration.

All holdings are leasehold and the average duration of leases is thirty years. Argument is sometimes advanced that insecurity of tenure restricts the amount which leaseholders are likely to spend on improvements. This may be true to a certain extent, but over a long period there has been practically no change in ownership of the various holdings, and over a period of 30 years there appears to be ample time to obtain adequate financial return for any expenditure on improvements.

Rentals.

These are subject to review on application by the lessee, and range from approximately 5s. per sq. mile up to 15s. per sq. mile.

Some of the country on the lowest range may be quite as good as that paying higher rentals but, in those cases, the extreme distances from transport facilities must be taken into consideration.

Lessees.

The entire area, which comprises the whole of the Diamantina and portion of the Boulia Shires, covering an approximate area of over 50,000 sq. miles, is held on lease by three companies. One of these has its headquarters in Brisbane, one in Sydney, and one in Adelaide.

It is obvious that the holdings in this part of the State are such that control by large companies with a spread of interests is the only method likely to be successful. A smaller landholder with a holding in this area as a single interest would, sooner or later, be dealt such a blow by seasonal conditions that recovery would be hopeless.

STATION MANAGEMENT.

Personnel Employed.

With one exception, the properties visited carried a resident manager, who was responsible to a general manager, who was also a director, or to a travelling manager in turn responsible to the general manager. The exception was the case of the principal of a company who was resident on and managed the principal station of the holdings.

As a general rule the manager is responsible for the actual running of the station and the management of the herds. In some cases, but not all, the manager is also responsible for the purchase of store cattle and herd bulls. He employs all labour and directs the activities of the station employees.

The lot of the manager is not an easy one and very little time is spent at the homestead. He usually camps with the stockmen on all mustering camps, during which times he lives as any other stockman. He attends, or arranges representation, at the general musters on adjoining holdings. Large numbers of travelling stock pass through most of the holdings, and it is the duty of the manager to see that such stock do not wander too far from the route, thereby destroying station feed and, more particularly, watering facilities.

The number of stockmen employed is not large. Even on properties running nearly 20,000 head of cattle, there are seldom more than six stockmen employed at any one time. Aboriginal stockmen are the exception; most places have none at all.

The stockmen spend practically all their time in mustering camps. They are either mustering for branding and marking, mustering fats for the road, mustering for movement from one part of the run to another, mustering for spaying, or mustering for movement of stores or breeders for sale.

A cow boy is usually employed for the performance of odd jobs about the station.

When available, a station cook is employed to do all the station cooking, and a musterers' cook for the camp cooking. It is not unusual, however, to find that the manager's wife, for a time, has to do the station cooking while the manager sometimes has to take a turn at musterers' cook.

On one property a mechanic was employed full-time to care for all mechanical equipment, but the manager is usually the mechanic, saddler, blacksmith, &c.

Areas and Carrying Capacities.

The average holding is from 2,000 to 2,500 square miles (largest holding 6,000 square miles) with a safe carrying capacity of from 3-4 beasts per sq. mile. As a general rule, places are stocked on conjecture as to what the following season will be. After having been "caught" at some time or another, most holdings now prefer to understock if anything.

Improvements, Including Watering Facilities.

Generally speaking, compared to the potential productivity value of the holdings, the expenditure on permanent improvements is small. There is practically no subdivision into paddocks beyond the provision of a horse paddock. There are no bullock paddocks for the holding of fats prior to going on the road; in some cases there are no boundary fences, and often where there is a boundary fence there is no wire in it.

Plate 11.

Typical Broncho Ramp.—Most of the handling of cattle is done in broncho yards scattered throughout the run, usually handy to water that would be available for the mustering camp. The broncho ramp shown above is not in a broncho yard (which usually consists of a single yard with plain wire fence) but is in an old out-station yard on the Diamantina.

There is usually one set of main yards on the station, sometimes, but not always, another set at an out-station, and a series of broncho yards scattered throughout the run. A broncho yard consists simply of a single yard with plain wire fence, large enough to hold 200–400 head and containing a broncho camp (Plate 11).

The provision of watering facilities perhaps receives more attention than any other improvement and even these in some cases are kept down to an irreducible minimum. On the other hand, some properties are very keen to put down as much water as possible and it is only the permit system operated by the Lands Department (a very necessary control) that has prevented more bores being put down.

The area is all within the artesian basin, and good water is obtained at depths from 2,000 to 3,000 ft. giving a flow of 1,000,000 gallons per day. This flow is usually cut back to about 300,000 gallons. From the bore, the water may simply run into a large waterhole to provide permanent watering at that spot, it may be run out in a bore drain (Plate 12), or it may run into a natural watercourse to render a creek permanent. All bores are artesian and therefore there are no pumps, mills, troughing, &c., to be kept in order.

Plate 12.

BORE DRAIN ON PEBBLY DOWNS COUNTRY ON THE DIAMANTINA WATERSHED.—Grass along the fringe of the bore drain is water couch with little evidence of having been grazed. A giant nut grass also grows along the banks of the drain. Steer in the picture is approximately 18 months, a good type of polled Shornhorn that makes up into prime baby beef.

Earthen tanks are not used for storage, but recently a large tank was sunk in the middle of Lake Machattie. There has been no water in the lake since the tank was completed, so it is not yet known whether it will be successful or not.

It would appear that, provided sufficient monies were expended, the artesian supply in the area, as a whole, would be sufficient to make the present holdings quite safe as far as water is concerned.

[TO BE CONTINUED.]

PLANT PROTECTION

Topical Notes on Pest Control.

Contributed by the Entomology Section, Science Branch.

A SUBSTITUTE SPRAY FOR NICOTINE SULPHATE.

FOR many years market gardeners and orchardists have used and depended upon nicotine sulphate for the control of small soft-bodied insects such as aphids. The principal source of this useful insecticide has been America, but supplies were below requirements during the war when the price of the material increased and shortages were experienced. In many cases alternative and less efficient materials had to be used.

Unfortunately, the market position regarding nicotine sulphate has not improved since the war; in fact, owing to the dollar exchange position it is now somewhat worse. At present the use of such nicotine sulphate is restricted to those who are prepared to pay the very high price at which it is quoted and none is going into prepared insecticidal dusts used by vegetable growers.

Fortunately, a new substitute material is now available, and, provided that it is used with due care, insects such as aphids can still be controlled. The new insecticide is hexaethyl tetraphosphate.* This material is a dark-brown liquid which is diluted one part in 1,600 with water; that is, one fluid ounce to 10 gallons for normal use. The addition of a neutral spreader is desirable. Those using it should provide themselves with a suitable small glass measure so that the required quantities may be accurately and economically measured.

The material is quite stable in its concentrated form, but once it is diluted with water it commences to break down. Any mixed spray that remains standing rapidly loses strength. In using this material, therefore, it is essential that the spray mixture be applied immediately it is prepared, and it should be sprayed directly on to the insects, making sure for instance that the undersides of the foliage are reached by the spray. Hexaethyl tetraphosphate is valuable for the control of red spider and tomato mites as well as soft-bodied insects such as aphids.

As hexaethyl tetraphosphate is a comparatively new insecticide, not a great deal is known about the practicability of mixing it with other insecticides or fungicides. Wherever possible the spray should be used by itself, except, of course, for the addition of a spreader.

*This material is at present marketed in Queensland under the trade name of "Hexone."

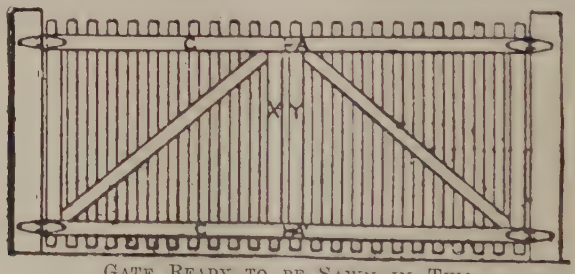
BROWN VEGETABLE WEEVIL.

The brown vegetable weevil is an introduced insect which attracts attention in winter and early spring as a pest of vegetables. The adult insect is, however, seldom seen by the grower, for feeding takes place at night. During the day both the adults and the larvae shelter in the soil and the more concealed parts of the plants. In practice, therefore, it may be assumed that vegetable crops with ragged and holed leaves on which no caterpillars can be seen are being attacked by this pest. As a check, a search in the ground near the base of some of the worst affected plants should bring to light the green legless grub, the somewhat whitish pupa or the greyish brown adult weevil.

Most of the damage in vegetable crops is caused by the larvae, but in spring and early summer, swarms of the adult may invade crops such as potatoes, and vegetable growers should both expect attacks and be prepared to apply control measures promptly in the early stages of an outbreak. As a first step, it is wise to keep weed growth suppressed; the insect feeds on a variety of plants and dense weed growth is bound to attract it. The next step is to apply a DDT dust or spray as soon as the damage is observed. Generally the spray gives better results than the dust and it should be used whenever possible. DDT preparations suitable for controlling the brown vegetable weevil are available in Queensland. Spray concentrations of the emulsion or dispersible powder types are added to water according to the manufacturer's specifications. The dusts usually contain 2 per cent. DDT and are applied as received in the container. One or two treatments should be sufficient for the average crop.

TO HANG A DOUBLE GATE.

A simple and easy method of constructing and hanging a double gate so that it will swing perfectly true when completed, is shown in the accompanying sketch. Make the gate in one piece by running the cross-pieces C from one post to the other. Leave a small space between the upright pieces X and Y, so that they will swing free of each other when the gate is cut in two. Hinge the gate to the posts at all four corners, testing the cross-pieces with a level. Then saw the gate in two at A and A, and the two halves will swing perfectly true and match each other.



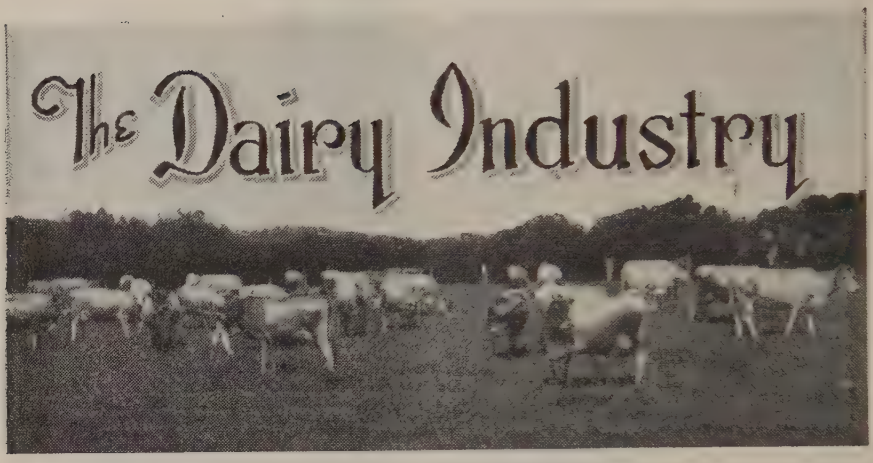
GATE READY TO BE SAWN IN TWO.

AN IMPROVISED FLOOR CRAMP.

Mr. R. A. Ward, of Wellington Point, writes that he has used a car jack for cramping floors when the ordinar floor cramp is not available. A 15-inch length of 3 x 1½ hardwood, with 2 fibro fluted nails protruding ¼-in., is held on the joist by means of a small D cramp and the jack pushes from the end of this hardwood piece.

Plate 13.

An Unusually Large Cluster of Custard Apples.—There were 37 fruits in this cluster from a tree of the Pink Mammoth variety in Mr. D. H. Morton's orchard, Rob Roy, Coochi Mudlo Island, Moreton Bay. The tree was propagated by a former Director of Fruit Culture, the late A. H. Benson, and planted in 1914. It has always been a prolific bearer—as much as 26 cases in one crop. In the last eight years it has had no pruning, except for the removal of dead wood. The height of the tree is 25 feet and it has a 40-ft. spread; it has never been fertilized.



Points in Dairy Practice.

V. J. BRIMBLECOMBE, Senior Dairy Adviser.

ON a considerable number of dairy farms it is quite apparent that very little thought has been given to planning of the farm lay-out. Consequently much valuable time and money is lost, and annoying inconvenience caused by difficulties encountered through this lack of a proper farm plan.

On some farms where facilities are well established and substantial it would be too expensive to conform to an ideal plan. However, it may be possible at little cost to improve or modify an existing establishment and provide more pleasant and profitable working conditions. On farms where facilities are more or less makeshift or haphazardly sited and general reorganisation is required, and also on properties on which dairying is about to be established, too much consideration cannot be given to planning for the best working conditions.

Dairying, as is well known, is an occupation to which constant attention has to be given every day of every year. To brighten and lighten this perpetual day-in and day-out routine, the following points on dairy planning and herd management are submitted for consideration.

Farm Lay-out.

Assuming that the dairy farm is situated in a recognised dairying district, and the soil is reasonably fertile, the first essential is a good, permanent water supply, preferably a running stream or an underground supply of good quality and ample quantity. On the location of the water supply will largely depend the choice of site for the necessary buildings. The building site should be high enough to ensure adequate drainage, and reasonably close to the main roadway entrance. The property should be subdivided into paddocks of ten to fifteen acres in area, and provision made for convenient laneways for rotational grazing and cultivation. Sound stock-proof fencing should be provided for all

boundary and subdividing fences with well-constructed gates so situated as to give the required ease of entry to the respective paddocks. On hilly country the fences should, as near as practicable, follow the contour of the slopes so that strip-cropping and contour-farming may be practised to prevent soil erosion.

Farm Buildings.

The farm buildings should be substantial in construction and of adequate dimensions for the purpose required; they should be laid out systematically and provision made for shelter trees and ornamental shrubs to form a fitting background. The dairy buildings should have a north-easterly aspect and be so situated as to enable the stock to be quietly and conveniently handled from the various paddocks, without excitement or bother. The milking shed and appurtenances should be so constructed as to ensure highest quality production of milk and cream. Essentials are well-constructed, combined dairy building lay-out including milking shed, engine room, separator or milk room, and an airy ventilated cream room or milk stand. Floors should be cemented and adequately drained. A plentiful supply of water should be available, together with proper cleansing and sterilizing facilities at the dairy premises. These include a steam sterilizer or twelve-gallon bricked-in boiler, wash-up trough, draining racks and the necessary equipment.

The whole of the dairy premises and surroundings should be kept clean and tidy to indicate pride of ownership. Manure accumulations in the yards and around the dairy buildings should be removed daily. This valuable fertilizer should be saved for distribution into cultivated paddocks. Dairy work should be done quietly and speedily and a high standard of efficiency should be the aim in all operations. Calf-feeding pens and piggery, should be conveniently situated and facilities provided to minimise the work entailed. Cement feeding floors are necessary to maintain sanitary conditions in the piggery. A proper feeding routine and suitable accommodation are also necessary to ensure profitable returns.

The Dairy Herd.

The dairy herd is the next consideration and in this respect two courses may be followed: Either a stud herd or a commercial grade herd may be established.

In selecting the breed of dairy stock several factors have to be considered, viz., area of the farm, type of country, climatic conditions, and the market to be supplied.

In the establishment of a stud herd it is not always possible, because of lack of finance, to purchase a complete foundation herd of purebred cattle. If this be so, it is advisable to commence the stud in combination with a grade herd. The stud animals should be the best obtainable, even though the number be few, rather than a large number of inferior animals. One important essential is a high-class sire whose blood lines are similar to those of the foundation females. After a few generations, by careful selection and culling, a complete stud of high-class stock can be established on sound breeding lines.

In establishing a grade herd, it is advisable to select a line of good-quality dairy heifers near to freshening; and in this case also a pure-bred sire from a cow of known production, and of the breed selected, should head the herd. To maintain a grade herd on sound lines a systematic herd testing programme should be adopted and when applied scientifically in selection and culling, and by the use of proven sires, a herd of high production attainment should be the outcome after a few generations. The herd sire or sires should be kept in a suitable paddock near to the milking yards, and not allowed to roam with the herd. If more than one sire is retained, a suitable breeding programme may be practised. Particular attention should be given to the keeping of service, calving and production records.

The health of the dairy herd should not be overlooked, as many diseases may impair production often for a considerable period. A veterinary chest with instruments and medicines for immediate use should be provided. All medicines should be suitably labelled to prevent incorrect use, and poisonous specifics should be kept under lock and key. Cleansing and sterilization of surgical instruments should receive proper attention. A hospital paddock where sick animals may be kept under observation is also an advantage, and a convenient crush for the handling of stock is essential.

Fodder Conservation.

No dairy farm is complete without some organised system of fodder conservation. No matter how well-bred cows may be, if they do not receive sufficient food of the right quality to maintain their milk flow and to keep them healthy the best results cannot be achieved. Permanent pastures should be established and properly maintained by judicious stocking and renovation. Suitable cultivated crops should be provided to supplement the pastures and to ensure a reserve of fodder in the form of hay or silage for the ever-recurring drought periods. A paddock of lucerne is an invaluable asset on all dairy farms. A reserve of suitable feeding grain is also desirable. After crushing, it can be fed when roughage is dry with beneficial results in the stimulation and maintenance of production. Cows grazing on over-succulent fodder should be provided after the evening milking with a ration of good-quality, grassy lucerne hay to prevent scouring, and restriction of cud-chewing when the grazing is over-sappy.

Convenient feeding-stalls lessen the labour involved in hand feeding and also enable the farmer to ration concentrates on individual production. Milking cows and young stock, especially springers, should at all times be kept in good condition, so that when freshening they are in a state of health to give maximum production immediately. Overstocking on a dairy farm should never be practised; in the long-run it is false economy.

It may take several years to institute an ideal dairy-farm lay-out and to build up and maintain a dairy herd of high production, but when progress can be achieved by working to a definite plan towards the ideal required, pleasure and profit will be the just reward.

Using Herd Recording Results.

S. E. PEGG, Senior Adviser (Herd Testing).

HERD recording is of little value unless the information gained is used in a practical way.

One of the first uses to be made of the records is their value when culling the herd. Naturally the farmer will cull the lowest-producing cows, but when consulting the production records of each cow the owner should consider the conditions under which the records were produced, viz., seasonal conditions prevailing, the age of the cow, the health of the cow, and the month of calving.

Most farmers can profitably cull a percentage of their lowest producers, and the remainder of the herd would benefit by the increased feed available. When culling, each man should cull all animals below some standard of production and endeavour to increase this standard each year.

Figures taken from the State Grade Herd Recording Scheme over a number of years show that the average production per cow is approximately 150 lb. butterfat, and of the number of cows tested 14 per cent. produced below 100 lb. butterfat, and 40 per cent. between 100 and 150 lb.; that is, 54 per cent. of the tested cows produced less than 150 lb. butterfat. This means that if a fixed standard of 150 lb. were laid down, on an average each farmer would have to cull 54 per cent. of his herd. Some farmers would have only a few to cull, but others would need to cull the entire herd. Obviously, such a practice may be uneconomical as many farmers may not have enough capital to buy a new herd. Therefore, it is suggested that each man should set his own standard and gradually raise it each year.

It should be remembered that the culling of low producers will not raise the standard of production to any appreciable extent unless it is associated with better feeding methods and replacement by the progeny of higher producers. Again, this calls for the use of production records, as the records enable the owner to select as replacements the progeny from the highest producing cows.

Herd recording plays another very important part in the economy of the industry by enabling the farmer to ascertain the capabilities of the bull to transmit production capacity to his heifers. The heifers should be tested as soon as they calve, and the information gained will determine whether the bull should be kept or not.

Monthly testing is particularly valuable when the farmer is feeding his cows, for he is able to ascertain the reaction of each cow to the feed given; and by feeding according to each cow's production, greater use is made of the available food. A man feeding the same amount to each cow overfeeds poor producers and underfeeds the better ones.

Herd recording also enables a farmer to keep a check on his own standard of husbandry. Comparison of results with others in the same district enables him to get an idea of the standard of his methods and his herd.

Pig Carcass Competitions.

THE Australian Meat Board in association with the Department of Agriculture and Stock and with the co-operation of all sections of the industry has completed a baconer pig carcass competition on a district basis. Judging and field days were conducted at Mareeba, Rockhampton, Toowoomba, and Brisbane.

Prize winners in their respective districts were:—

—	Breed.	Total Points.	Percentage.
	MAREEBA.		
1st—H. J. Williams, Yungaburra	Canadian Berkshire x Large White	99 & 96 195	78
2nd—J. C. Carson, Malanda	Large White x Saddleback x Berkshire	97 & 96½ 193½	77·4
3rd—W. Hastie and Sons, Atherton	Canadian Berkshire ..	98½ & 89½ 188	75·2
	ROCKHAMPTON.		
1st and Champ.—V. E. Jones, Kalapa	Canadian Berkshire ..	98½ & 97½ 196	78·4
2nd—A. W. Hodgkinson, Koongal	Berkshire x Large White ..	96 & 85½ 181½	72·6
3rd—G. White, Ridgelands ..	Large White x Canadian Berkshire	91 & 89½ 180½	72·2
	TOOWOOMBA.		
1st—H. J. Franke & Son, Crow's Nest	Large White x Large White x Berkshire	99½ & 89½ 189	75·6
2nd—E. C. Mengel, Mount Kent	Canadian Berkshire x Saddleback x Tamworth	94½ & 90 184½	73·8
3rd—Roushte Bros., Ravensbourne	Large White	95 & 88 183	73·2
	BRISBANE.		
1st—Kingston Stud Piggery, Kingston	Large White x Large White grade	86½ & 85 171½	68·6
2nd—A. E. Snare, Forest Gate Stud, Rosevale	Tamworth	80½ & 70½ 160	64
3rd—N. E. Meyers, Kallangur	Large White	85½ & 70½ 156	62·4

The championship was awarded to Mr. V. E. Jones, of Kalapa, via Rockhampton, for a team of two Canadian-type Berkshire pigs which were awarded 98½ and 97½ points respectively, a total of 196 or 78.4 per cent. These carcases were of very good type and scored well in all points. They were nicely balanced and evenly proportioned, well fleshed with an even covering of good quality fat. An interesting factor was that they were produced under full grazing conditions.

Although the competitions were successful, the number of entries was somewhat disappointing. However, because of unavoidable circumstances it was not possible to make known the conditions or date of the competitions in time to allow possible exhibitors the necessary period to select or breed suitable pigs. It is expected that a considerable increase in entries will come from all centres next year.

Generally, bearing in mind the time factor, the average quality of the carcases was good and may be taken as representative of the pigs produced in each district. This argues well for the success of future competitions and an improvement in the general standard may be expected.

At Mareeba arrangements were made by the District Adviser, Pig Branch (Mr. T. Abell), in association with the Manager of the North Queensland Bacon Association (Mr. Dunlop), to hold a field day at the factory, at which approximately 40 farmers attended. Seven entries were available for judging, the carcases being presented in a very fair condition, but farmers were advised that more care would have to be taken in the handling and transport of their pigs to the factory. Body length and development of eye muscle were the main points needing attention. Carcases generally were short and eye muscle developmnet poor in some cases. Streak and backfat were very fair, but hams and shoulders require attention.

At Rockhampton the arrangements for the field day, at which 50 farmers attended, were made by Mr. Ross Nott, Divisional Veterinary Officer, in collaboration with the management of the C.Q.M.E. Co. Ltd. who also provided lunch. Fourteen entries were received and the presentation of the pigs was something of which to be proud. The dressing was excellent and the whole organisation could not have been bettered. The chief faults revealed in the judging were a deficiency in the hams, which could have been better developed. Body length was short and in several cases fat development was excessive.

At Toowoomba, arrangements were made by the District Adviser, Pig Branch (Mr. C. Porter), together with the management of the Darling Downs Co-operative Bacon Association, at whose factory facilities were made available for judging, and a field day arranged at which 60 farmers attended. Sixteen entries were received and, as elsewhere, body length and eye muscle development were the main features requiring improvement. The thickness of backfat was very fair, although streaks could have shown a greater percentage of lean meat.

At Brisbane, it was decided to carry out the judging on Monday, 31st May, 1948, and to hold the field day in conjunction with the awarding of the championship on Wednesday, 2nd June, 1948. The arrangements were made by Mr. E. L. Melville, Senior Adviser, Pig Branch,

in association with the Queensland Meat Industry Board, the Australian Meat Board, Department of Commerce and Agriculture, Darling Downs Co-operative Bacon Association, Doboy, and Queensland Co-operative Bacon Association, Murarrie. Eight entries were received and carcases were well presented for judging. Body length was short, however, and eye muscle development required considerable attention; backfat in most cases was too thick and extended well into the streak.

Approximately 100 people attended the field day at the Abattoir, where arrangements were made for an inspection of the works before lunch, which was provided by the Queensland Meat Industry Board. Addresses were given by Mr. P. Becker, Queensland representative of the Australian Meat Board (who presided), Mr. E. L. Melville, Senior Adviser, Pig Branch, Department of Agriculture and Stock, Mr. E. Reid, Veterinary Officer, Department of Commerce and Agriculture, Mr. G. Tomlins, Works Superintendent, Queensland Meat Industry Board, and Mr. F. Bostock, Officer in Charge of Pig Branch, and Competition Judge.

The State Championship trophy was presented by Dr. A. R. Haywood, Pig Producers' representative of the Australian Meat Board.

COLONIES TO FEED EUROPE.

In the light of the recent agreement between the British and Queensland Governments for the development of grain sorghum—pig production in Central Queensland, an article appearing in "Foreign Agriculture" for March, 1948, is interesting. The authors point out how European countries having overseas territories are making efforts to expand food production in them. The plans tend to emphasise the particular crops to which an area is believed to be best suited, or the production of which seems capable of being expanded rather rapidly by large scale development. Important among the commodities emphasised are vegetable oils, rice and cocoa. In a number of cases, however, other grains, fruits and vegetables, or dairy and other livestock products are included in part by way of providing more adequate local food supplies as a means of improving labour supplies and the living conditions of the people.

Projects mentioned in the article include Belgian plans to increase production of vegetable oils, such as palm, palm-kernel, cottonseed and peanuts in the Belgian Congo; French plans for irrigation and drainage in Madagascar, and expansion of peanut, rice, palm and palm-kernel oil, and cocoa production in French Africa; Dutch attempts at restoration of copra and palm-oil production in the Netherlands East Indies; and British programmes for intensive production of foodstuffs in British East Africa, British West Africa, the Rhodesias, Nyasaland, Malaya, Solomon Islands and British Caribbean region, particular emphasis being placed on such crops as cocoa, peanuts, soybeans, wheat and rice.

UNLABELLED WATER SAMPLE.

A small essence bottle of water carrying a label of the Port Curtis Co-operative Dairy Association Ltd., Wowan, was left at the Head Office of the Department on May 31 without any details as to its origin. The person who left this sample is requested to send a beer bottle full for analysis, together with his name and address and details of the water supply.

ANIMAL HEALTH

Control of Worm Parasites of Sheep.*

H. McL. GORDON, McMaster Animal Health Laboratory, Sydney.

SUPPLIES of drenches are now generally adequate but it is still advisable to conserve supplies. Drenches are more expensive than in the pre-war period. Control methods should aim at preventing outbreaks of parasitic diseases rather than curing them after losses have occurred. Reduction in the amount of handling and drenching of sheep must be an objective in all control measures.

The practical problems the grazier has to overcome in controlling worm parasites in his sheep are discussed in the following pages.

MAKING THE BEST USE OF DRENCHES.

Supplies of carbon tetrachloride, nicotine sulphate, phenothiazine and tetrachlorethylene, all short during the war period, are now generally adequate, but it is still wise to conserve these drugs and to consider their costs.

Phenothiazine.

Although the cost of phenothiazine is still considerable, it is largely offset by the marked superiority of the drug. Phenothiazine should be used especially to prevent outbreaks due to the nodule worm and small intestinal worm. It should not be used indiscriminately. The times to use phenothiazine are discussed later (see Drenching at Strategic Periods, page 40).

Bluestone-Nicotine.

This mixture has long been used indiscriminately as a treatment for "worms." It is relatively expensive and nicotine is still scarce. It should, therefore, be reserved for treatment of young sheep, particularly weaners, suffering from small intestinal worm. Do not use bluestone-nicotine mixture for treatment against large stomach worm. It is no more effective against large stomach worm than bluestone-arsenic mixture, which is much cheaper. Bluestone-nicotine mixture is not always highly efficient against small intestinal worms in all sheep, but if it is used at strategic periods it gives a satisfactory measure of control. It is likely to fail in a bad outbreak. Under such circumstances, use phenothiazine, if not for the whole flock, at least for the "tail."

Carbon Tetrachloride.

This drug, which is essential for treatment against liver fluke, is commonly used for treatment against large stomach worm, but in view of the unpredictable losses which sometimes follow its use and the

* Published by arrangement with the Commonwealth Council for Scientific and Industrial Research.

cheapness of bluestone-arsenic mixtures which can replace it as a treatment for large stomach worm, there is good reason to restrict its use.

Bluestone-Arsenic.

This is a cheap and effective treatment against large stomach worm and, provided mixtures are properly made and the recommended dose rate is strictly followed, it is quite "safe."

It is particularly useful for the control of large stomach worm in grown sheep. For young sheep, bluestone alone may be used but the bluestone-arsenic mixtures are preferable.

Bluestone alone is not very effective against the large stomach worm in grown sheep unless the usual dose rate is increased (see dose rate later in these notes), and further, bluestone is not effective against immature worms. Bluestone-arsenic mixture is much more effective.

Drenches containing bluestone alone, bluestone-nicotine or bluestone-arsenic are effective against large stomach worms in about 90 per cent. of sheep. They fail in the other 10 per cent. because they are swallowed into the paunch instead of into the fourth stomach. Carbon tetrochloride and phenothiazine are the only two drugs known to be effective against large stomach worm when swallowed into the paunch, and either of these may be used successfully to treat the sheep which fail to respond to bluestone mixtures. Under normal conditions phenothiazine or carbon tetrachloride could be used as an alternating treatment, if not for the whole flock then for those sheep which fail to respond to other treatments. The minimum effective dose of phenothiazine against large stomach worm is between 5 and 10 grammes. A 10 gramme dose (48 sheep to the pound of phenothiazine) is almost certainly 100 per cent. efficient against this parasite. A 5 gramme dose is highly effective. Double strength mixtures of carbon tetrachloride should be used; that is, each sheep should receive 2 c.c. of the drug mixed with 3 c.c. liquid paraffin.

Tetrachlorethylene.

When this drug is given with, or immediately after, a dose of bluestone solution it is very effective against large stomach worm. It is more effective than bluestone-nicotine against small intestinal worm and although it sometimes causes staggering, or even temporary unconsciousness, the sheep soon recover if protected from injury by their fellows.

PREPARATION AND USE OF DRENCHES.

Phenothiazine.

This drug is marketed as "Phenovis," "Phenzeen" and "Phenovine" in the form of a powder which mixes with water to form a suspension suitable for drenching. Ready prepared suspensions are also available.

Non-automatic drenching syringes are commonly used for the administration of phenothiazine suspensions. Automatic drenching apparatus has in general not been satisfactory for use with phenothiazine, but the "Palm Drenching Gun" and the "Victor Drenching Apparatus" are very satisfactory. Whatever type of instrument is used, a nozzle

about 6 inches long is required so that the dose can be placed well back over the tongue, thereby avoiding slobbering, which leads to staining of the wool.

A double bucket, like that shown in Plate 14, is useful when using a syringe. One side of the bucket contains phenothiazine and the other side water, which is used to rinse the nozzle before a sheep is drenched. If the nozzle is not rinsed, phenothiazine suspension will drip and stain the wool. Fresh rinsing water should be used for each race full of sheep to be drenched.

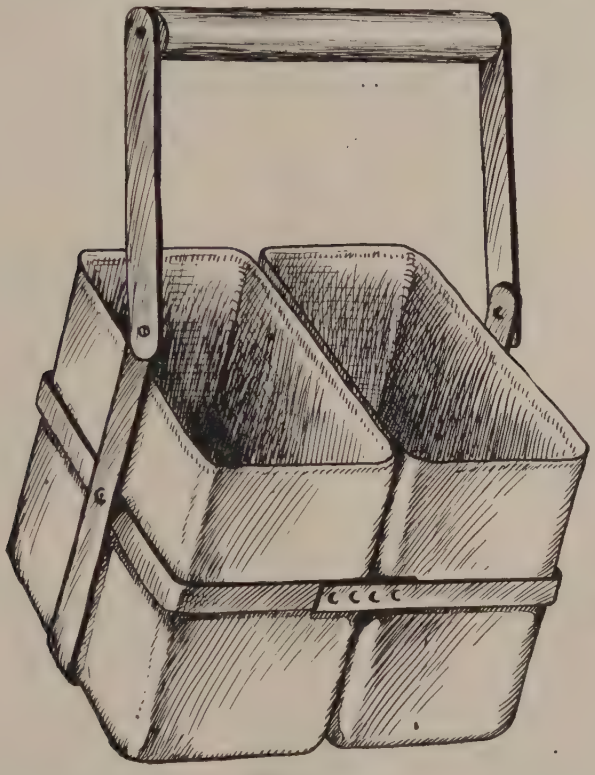


Plate 14.
Double Bucket for Drenching with Phenothiazine.

Preparation of Phenothiazine Drench.

The powder is usually packed in 1 lb. and 7 lb. containers. The simplest way is to take 1 lb. of powder and add water gradually, stirring thoroughly to produce a creamy suspension, finally making the quantity of the mixture up to the required amount for the number of sheep to be dosed per pound. Finally, run the mixture through a fine sieve such as a double thickness of fly-wire.

As an example, suppose that weaners are to be dosed at 30 per pound. Take 1 lb. powder and add water, mixing thoroughly, so that eventually there is 30 fl. oz. (1½ pints) of mixture; that is, 30 doses at 1 fl. oz. each. Similarly, if a 7 lb. lot of powder is to be mixed, add water until the suspension measures 210 fl. oz. (10½ pints). Occasionally when the requisite amount of water has been added the mixture is too thick for use with drenching syringes. Extra water must then be added

until the mixture is sufficiently thinned for use. When this has been done the amount of mixture must be measured and adjustments made so that the correct dose will be given to each sheep.

A measuring jug marked in fluid ounces and pints is of great assistance in making up phenothiazine, and indeed, all drenches.

The Dose Rate.

In order to obtain high efficiency against the small intestinal or hair worm (known also as black scour worm), use 1 lb. phenothiazine powder for 20 grown sheep, 25 young sheep 8-12 months old, or 30-40 weaners 4-8 months old. The higher the dose, the greater the efficiency, and as it is particularly necessary to obtain a good kill of these worms in young sheep, it pays to dose only 30 weaners per pound of powder.

MIXTURES AND DOSES OF PHENOTHIAZINE FOR USE AGAINST SMALL INTESTINAL WORM.

Dose.	Amount of Phenothiazine.	Add Water until Mixture Measures.
For Weaners 4–8 months old, at 30 per lb.		
25 c. c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c. c. (1 fl. oz.)	1 lb.	30 fl. oz. (1½ pints)
	7 lb.	210 fl. oz. (1 gall. 2½ pints)
For Young Sheep 8–12 months old, at 25 per lb.		
30 c. c. (1 fl. oz.)	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
35 c. c. (2 x 17½ c. c.)	1 lb.	29 fl. oz. (1½ pints)
	7 lb.	203 fl. oz. (1 gall. 2 pints)
40 c. c. (2 x 20 c. c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)
For Grown Sheep, at 20 per lb.		
40 c. c. (2 x 20 c. c.)	1 lb.	26½ fl. oz. (1 pint 6 fl. oz.)
	7 lb.	185½ fl. oz. (1 gall. 1¼ pints)
50 c. c. (2 x 25 c. c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)
60 c. c. (2 x 30 c. c.)	1 lb.	40 fl. oz. (2 pints)
	7 lb.	280 fl. oz. (1 gall. 6 pints)

MIXTURES AND DOSES OF PHENOTHIAZINE FOR USE AGAINST NODULE WORMS.

Dose.	Amount of Phenothiazine.	Add Water until Mixture Measures.
For Weaners 4–8 months old, at 40 per lb.		
20 c. c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c. c. (1 fl. oz.)	1 lb.	40 fl. oz. (2 pints)
	7 lb.	280 fl. oz. (1 gall. 6 pints)
For Young Sheep 8–12 months old, at 30 per lb.		
25 c. c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c. c. (1 fl. oz.)	1 lb.	30 fl. oz. (1½ pints)
	7 lb.	210 fl. oz. (1 gall. 2½ pints)
For Grown Sheep, at 25 per lb.		
30 c. c. (1 fl. oz.)	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
40 c. c. (2 x 20 c. c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)

Staining of the Wool should be Avoided.

One disadvantage in the use of phenothiazine is that it stains the wool. This is brought about in several ways, namely (i) from drippings from the nozzle of the drenching syringe or pistol, (ii) by the soiled hands of the person drenching, (iii) by the soiled mouth of the drenched sheep when wiped on another sheep, and (iv) by the phenothiazine passed in the urine. *Staining can be avoided by observing the following precautions*:

1. Rinse the nozzle in water immediately after filling the syringe with phenothiazine. The double container already mentioned provides water for this purpose, as well as for periodical flushing of the instrument. The water container must be emptied out and refilled with clean water periodically because it soon comes to contain phenothiazine from rinsing the nozzle and drips of it will then stain the wool. There is, of course, still some dripping from the nozzle, but if rinsing water is renewed after each batch of sheep in the race is drenched the amount of staining is very slight. Dripping can be almost eliminated by using a wiper attached to the container. A small roll of cloth or sacking attached to the rim of the water container is sufficient to remove the excess rinsing water from the outside of the nozzle of syringe. Instead of, or in addition to, the rinsing of the phenothiazine from the nozzle, a special wiper may be used. A suitable wiper consists of a piece of felt or Feltex held between two pieces of sole rubber or leather. In both the rubber or leather, and the felt, are cut U-shaped notches, those in the felt being smaller than those in the rubber or leather. The wiper is rivetted to two pieces of tin or iron which form a sliding grip to attach the wiper to the side of the drench container. The wiper can be removed easily and washed free of phenothiazine from time to time. This type of wiper may be used instead of rinsing water, or in addition to it.

2. Carry or hang several pieces of cloth near the race so that the hands can be wiped periodically. Usually the left hand becomes soiled when a sheep slobbers the dose.

3. The race should be open behind the man drenching so that the sheep can go into a roomy yard immediately. If they are packed in the race or a small yard there will be a great deal of staining from the mouth rubbing on the sides or rumps of other sheep.

4. Do not hold sheep in yards more than an hour or so after drenching. It is unwise to muster, hold or drive them during the three days after drenching. Urine staining is of little consequence if these precautions are taken.

When an automatic apparatus is used there is practically no dripping from the nozzle, but the other precautions listed should be observed.

It is well worth noting that many millions of sheep have been drenched with phenothiazine in various parts of the world without any ill-effects. Recently, however, in both New South Wales and Queensland, reports have been received that the drug has caused the death of the foetus when in-lamb ewes are treated within a fortnight of lambing. For this reason, it may be advisable not to use this drug within a month before lambing.

It is, of course, inadvisable to use any kind of drench when ewes are advanced in pregnancy, as pregnancy toxaemia or hypocalcaemia may result from the yarding and temporary starvation that is involved.

Treatment of ewes before lambing is essential to reduced contamination of pastures with worm eggs and thereby protect the lambs. Two treatments, one at two months and the other not less than one month before lambing are usually advisable.

Bluestone.

Bluestone solutions can be readily prepared, the only precautions being to use exact, carefully weighed quantities, and glass, copper, wooden, or earthenware containers. Old car battery containers are useful. Mixtures and dose rates are:—

(i.) Two per cent. solution—Dissolve 1 lb. bluestone in 5 gallons of water.

Doses—

Grown sheep ..	4 fl. oz.	(specially increased dose)
Sheep 12-18 months..	1½ fl. oz.	(45 c.c.)
Sheep 8-12 months ..	1 fl. oz.	(30 c.c.)
Sheep 4-8 months ..	¾ fl. oz.	(25 c.c.)
Lambs under 4 months	½ fl. oz.	(15 c.c.)

(ii.) Four per cent. solution—Dissolve 1 lb. bluestone in 2½ gallons (or 2 lb. in 5 gallons).

Doses—

Grown sheep ..	2 fl. oz.	(specially increased dose)
Sheep 12-18 months..	¾ fl. oz.	(25 c.c.)
Sheep 8-12 months ..	½ fl. oz.	(15 c.c.)

For younger sheep use 2 per cent. solution.

Bluestone-Nicotine.

Many ready-for-use preparations of bluestone-nicotine are on the market. Mixtures are however, readily and cheaply made. Use a 2 per cent. solution for younger sheep and a 4 per cent. solution for older sheep. A 2 per cent. solution is made by dissolving 1 lb. bluestone in 5 gallons of water and adding 16 fl. oz. nicotine sulphate (commercial Black Leaf 40). A 4 per cent. solution is made by dissolving 1 lb. bluestone in 2½ gallons of water and adding 16 fl. ozs. nicotine sulphate.

DOSE RATES.

Age.	2 per cent. Solution.	4 per cent. Solution.
Grown sheep	2 fl. oz. (60 c. c.) ..	1 fl. oz. (30 c. c.)
Sheep 12–18 months	1½ fl. oz. (45 c. c.) ..	¾ fl. oz. (25 c. c.)
Sheep 8–12 months	1 fl. oz. (30 c. c.) ..	½ fl. oz. (15 c. c.)
Sheep 4–8 months	¾ fl. oz. (25 c. c.) ..	⅜ fl. oz. (12 c. c.)
Lambs under 4 months ..	½ fl. oz. (15 c. c.) ..	¼ fl. oz. (8 c. c.)

If the weather is very hot or if the sheep are in very poor condition, or if severely anaemic, reduce the amount of nicotine from 16 fl. oz. to 12 fl. oz. for the first dose, or until the sheep improve in health and/or the weather cools.

Bluestone-Arsenic Mixtures.

(1) Bluestone-Arsenite of Soda.

Dissolve ½ lb. bluestone in 1 gallon of water. Dissolve 2 oz. arsenite of soda containing 60-65 per cent. As_2O_3 in 1 gallon of water. Mix these solutions and a green, cloudy sediment forms. This is cleared by adding 1½ fl. oz. spirits of salts (commercial hydrochloric acid). Finally, make up to 3 gallons with water.

(2) Bluestone-Arsenic Pentoxide.

Dissolve ½ lb. bluestone and 1½ oz. arsenic pentoxide in 3 gallons water. There should be no sediment. Make sure that the pentoxide will dissolve in water.

Doses for both mixtures are—

Grown sheep	1 fl. oz. (30 c.c.)
Sheep 12-18 months ..	¾ fl. oz. (25 c.c.)
Sheep 8-12 months ..	½ fl. oz. (15 c.c.)
Sheep 4-8 months ..	⅜ fl. oz. (12 c.c.)
Lambs under 4 months ..	¼ fl. oz. (8 c.c.)

If bulkier doses are preferred—and they are desirable for sheep younger than twelve months—use the same amounts of arsenic preparations as above but *double* the amount of bluestone and *double* the amount of water. The dose rates will be *double* those given above.

When accurate scales for measuring small quantities are not available the following method can be used:—

(i.) Make a stock solution of arsenic pentoxide by dissolving 1½lb. in 10 pints of water (or 1 lb. arsenite of soda (60-65 per cent. As_2O_3) in 8 pints);

(ii.) Dissolve ½ lb. bluestone in 1 gallon of water;

(iii.) Mix this bluestone solution with 1 pint of either of the arsenic solutions.

(iv.) Make up the mixture to 3 gallons with water;

(v.) If arsenite of soda is used, add 1½ fl. oz. spirits of salts;

(vi.) Strain the mixture through a piece of cloth.

The doses given should not be increased. They are effective, and an increase is likely to kill the sheep. Remember, that bluestone-arsenic mixtures are effective only against large stomach worm (*Haemonchus*) and should be used, therefore, from the early spring to autumn. In winter, use bluestone-nicotine for young sheep. It is advisable to strain all drenches containing arsenic through a piece of cloth before use. This is in case there is any undissolved arsenic present.

Arsenical Poisoning.

If used according to the directions given, the mixtures containing arsenic should be perfectly safe for sheep. The dose rates must be strictly followed. Be sure that all of the arsenical preparation used dissolves completely. If there is any sediment, strain off through a bag or cloth. If a sediment is noticed in the bottom of the container after using most of the drench, do not use the remaining solution. Mixtures should be stirred frequently during drenching. Sheep should not be starved before treatment but should be kept away from water for two or three hours

after drenching. If sheep show ill-effects after the use of drenches containing arsenic, use the following antidote:—1 to 2 teaspoonsful of "hypo" (sodium thiosulphate, used in photography) dissolved in a half-cup of water. Swab the mouth, or drench with a few c.c. of 5 per cent. bluestone, before giving the "hypo."

General.

There is no need to use complicated or expensive drenches. The simple mixtures will give adequate control of parasites if used according to recommendations made here.

Before buying a drench, be certain of your objectives. You should know when you are going to use it and you should know which parasites you are dealing with.

Phenothiazine is expensive because the compounds used in its manufacture are expensive and the manufacturing process is slow and complicated. The cost of phenothiazine can be offset by its very high efficiency provided it is used at the right time. It is practically the only drench which has a true preventive value, for it is effective in every sheep treated and by killing a very large proportion of the worms so reduces the contamination of pastures with worm eggs that reinfestation is reduced to a very low level.

DRENCHING AT STRATEGIC PERIODS.

Strategic and Tactical Drenching.

Strategic drenching is preventive drenching and is based on knowledge of the seasonal occurrence of infestations with the more important worm parasites. This knowledge has been gained chiefly from detailed field trials carried out at the C.S.I.R. Laboratory at Armidale, New South Wales, and from the worm survey trials carried out in Queensland by the C.S.I.R. in conjunction with the Department of Agriculture and Stock and certain graziers.

The accompanying chart (Plate 15) shows the seasonal changes in worm burdens with the three more important parasites and indicates strategic times for treatment. Strategic drenching should be carried out at the appropriate time, year in year out, no matter what the weather has been, for at any time the climatic conditions may suddenly change to favour the parasites.

Tactical drenching is aimed at preventing an increase in infestation after climatic conditions have been particularly favourable for the parasites. The worms work by the weather and drenching by the weather (tactical drenching) should forestall them. A fall of rain of 40-50 points or more accompanied by a few dull, humid days favours development and survival of the eggs and larvae of worm parasites on the ground, and sheep will begin to pick up larvae during the next few days. About three weeks later these larvae will have grown into mature worms, ready to begin laying eggs to add to the contamination of pastures. Worms younger than about 15-18 days old are more resistant to drenches than adult worms, and thus it is rather wasteful to drench until the worms are mature. Drenching about three weeks after rainy, dull weather catches the worms at a susceptible age and kills them before they can lay eggs to contaminate the pastures.

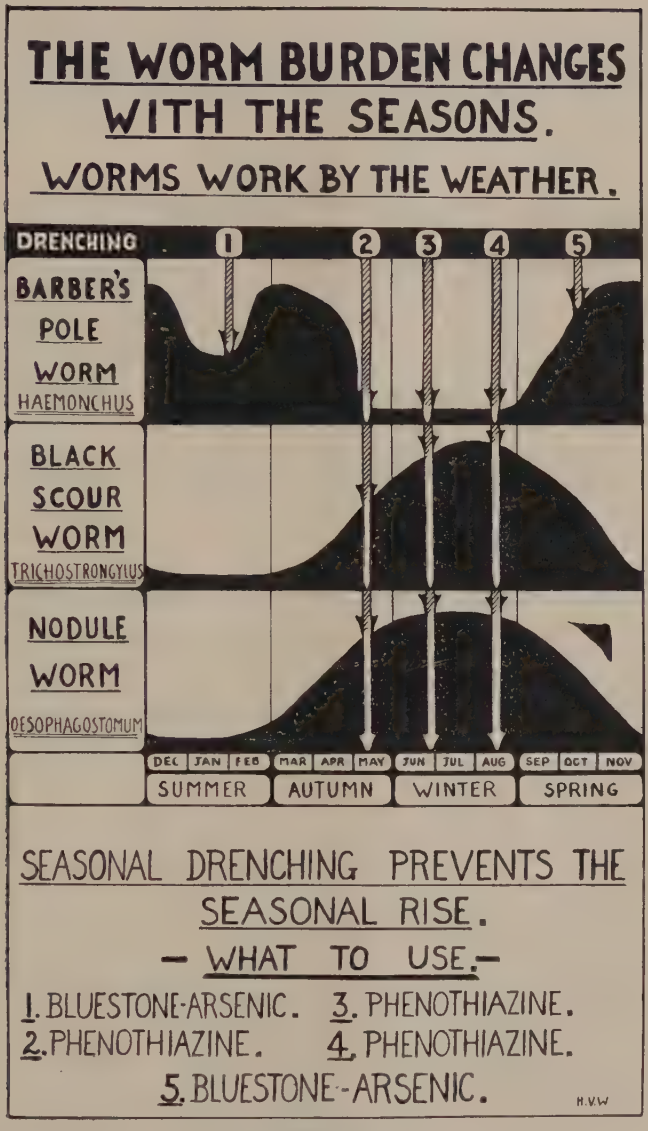


Plate 15.
Strategic Drenching.

The nodule worm, because of its special, long drawn-out life-cycle, presents particular problems, which are discussed later.

Dryness, with heat or cold, is the greatest destructive force against eggs and larvae on pastures, and sheep are unlikely to acquire infestations during dry periods. It should be remembered, however, that sheep may carry over a previously acquired infestation into a dry period. If dry weather persists for a month or two and feed is becoming scarce it is advisable to drench. By removing the worms, which were acquired before the dry spell, the sheep will be given a better chance to thrive

under the dry conditions. It is as well to remember that in dry time sheep may overcrowd and overgraze certain local areas of green feed—for example, frontages, gullies, gilgais, &c.—and in these situations many eggs and larvae may accumulate. Whenever sheep are observed to be congregating in such situations it is advisable to drench them, whether there has been rain or not.

Large Stomach Worm or Barber's Pole Worm (*Haemonchus*).

This is a summer parasite picked up from spring through summer into early autumn. Its effects are quickly developed. Outbreaks are closely related to rainfall. A fall of 40 to 50 points or more, accompanied by dull, humid weather, will be followed by increased infestation of sheep from the pastures. By treating sheep about three weeks after such a period the developing worms will be killed before they have begun to lay eggs to contaminate the pastures further. If rains and dull weather persists over some weeks, treatment should be repeated at intervals of three weeks until the weather becomes hot and dry or cold and dry. A final treatment should be given three weeks after a period of wet weather has ended. Unless this is done, sheep are likely to carry on a heavy infestation which may later cause trouble.

Nodule Worm (*Oesophagostomum columbianum*).

This is a summer parasite depending on adequate rainfall during late spring through summer to early autumn. Larvae are picked up from pastures during the warmer months but develop slowly in the sheep and may not lead to severe ill-effects until the late autumn, winter, or even early spring months. Lack of adequate food during winter months increases the severity of the effects of this parasite. Treatments should be carried out as follows:—

(i.) Treat all sheep, and particularly breeding ewes, late in August. This will reduce contamination of pastures for spring and will protect spring lambs;

(ii.) Treat young sheep in autumn;

(iii.) Treat all sheep in winter (June-July) if infestations are severe.

(See special section on Nodule Worm, page 48.)

Small Intestinal Worm or Black Scour Worm (*Trichostrongylus*).

This is a parasite of the cooler months and is picked up in autumn, winter, and early spring. The ill-effects are usually seen in winter and are aggravated by shortages of feed. A wet autumn followed by a dry winter, and a wet winter followed by a dry or late spring, are likely to bring about severe outbreaks of black scours.

Treatment should be carried out as follows:—

(i.) Treat breeding ewes two months and one month before lambing. This is particularly important if they lamb in autumn. It reduces the chances of lambs becoming heavily infested;

(ii.) Treat lambs at weaning time whether they are thriving or not. This applies particularly to spring lambs, which are weaned in autumn, when this parasite is prevalent;

(iii.) Treat young sheep (lambs, weaners, rising two-tooth) fairly regularly (every four or five weeks) from autumn until the spring feed comes away. The wetter the season the more often should treatment be repeated; but remember that a wet autumn followed by a dry winter in especially dangerous.

A Co-ordinated Programme.

The chart illustrating the seasonal rise and fall of the three important worm parasites shows strategic times for drenching. These are not fixed for any particular date but should be carried out within a week or two of the period indicated on the chart. The timing of the late August drenching with phenothiazine is of greatest importance, for if delayed until the weather has warmed up its object may be defeated.

The drenching recommended on the chart has a number of objects:—

1. This dose of bluestone-arsenic is planned to prevent the late summer rise of large stomach worm infestation;
2. This dose of phenothiazine has several objects. It is a weaning-time treatment for spring lambs and a pre-lambing treatment for ewes to lamb in autumn. It reduces the number of nodule worms before the sheep enter the winter. It prevents a carry-over of large stomach worm into the winter. It forestalls the autumn rise of small intestinal worms;
3. This dose of phenothiazine is of greatest importance in districts where nodule worm and small intestinal worm infestations are severe. It removes nodule worms which have emerged from nodules in the bowel wall since No. 2 treatment. It is a second attack on small intestinal worms;
4. This dose of phenothiazine is probably the most important drenching in the year. It forestalls the spring rise of large stomach worm. It removes nodule worms before they begin a new season's cycle of infestation. Cold and dryness hinder the development of eggs and larvae of nodule worm on the ground with the result that during the winter little infestation is picked up by sheep. By the end of the winter most of the young nodule worms will have emerged from the nodules and will be vulnerable to drenching. This treatment late in August is the chief attack on nodule worm. It also prevents a carry-over of small intestinal worm from the winter—a very important matter if the spring and early summer are dry and do not provide the flush of feed which normally helps to remove this parasite;
5. This dose of bluestone-arsenic is a second attack against large stomach worm planned to check the spring–early summer rise of infestation.

Considerations of Husbandry.

(1) Stocking influences the occurrence of worm diseases in many ways. Overstocking results in heavy contamination of pastures with worm eggs and eventually leads to malnutrition from eating-out of the best feed. Overcrowding also leads to heavy contamination of pastures with eggs though feed may remain adequate (for example, leaving large numbers of sheep on an improved pasture for a long period). Overstocking may be local or general in a paddock or on a property. Local

effects are seen where sheep persistently regraze the same areas and neglect the rest of the paddock. The overgrazed areas soon become heavily contaminated with worm eggs and are "danger areas" for infestation of sheep grazing over them.

Overstocking or overcrowding, whether local or general, is an indication for drenching—and even more important, for reduction of stocking and spelling of areas. The dangers of local overgrazing are often overlooked.

(2) Inadequate feed reduces the resistance of sheep to worms. In addition, when feed is scarce sheep have to spend more time in grazing and have to graze closer to the ground. The chances of sheep picking up large numbers of worm larvae are thereby increased. During any period when malnutrition is evident, drenching, particularly of young sheep and breeders, should be carried out.

(3) Young sheep and very old sheep are specially susceptible to worms. Breeding ewes also suffer severely. Young sheep require regular drenching to protect them against worm infestation. Breeders should be treated before lambing in order to keep them as free from worms as possible while they have lambs at foot.

USING THE APPROPRIATE DRENCH FOR EACH PARTICULAR PARASITE.

The strategic drenching plan illustrated in the chart is based on actual observations of the annual changes in the worm burden and is an attempt to relieve the grazier from worrying whether his sheep are infested, and, if so, with which species of worms.

However, there will be occasions when a grazier wishes to know what the worm burden of his sheep may be.

The days when sheep were treated for "worms" should long be past. Different kinds of worms produce different diseases at different times of the year and require different drugs for treatment. In other words, a correct diagnosis is essential.

Diagnosis may be based on one or more of the following:—

(*a*) Recognition of symptoms;

(*b*) Examination of droppings;

(*c*) Post-mortem examination.

Recognition of Symptoms.

It is unusual to find a sheep infested by only one kind of parasite, but it is usual to find that one kind predominates and is chiefly responsible for the symptoms seen. Each parasite produces special symptoms which can usually be recognised. The more important parasites of sheep cause the following symptoms:—

(i.) *Large Stomach Worm* (*Haemonchus*).—Severe anaemia present, as shown by paleness of skin and eye membranes; "bottle-jaw" in severe cases; lack of stamina when driven; loss of condition not necessarily present—fat sheep may die; no scouring unless on lush pastures. Outbreaks generally occur from late spring to autumn;

(ii.) *Small Intestinal Worm* (*Trichostrongylus*).—Usually no anaemia; loss of condition very pronounced; scouring usual, but may not be severe if feed is dry. On green feed, typical "black scours" is seen. On dry feed droppings may not be dark in colour. Symptoms are usually seen from autumn to spring. This parasite usually affects young sheep only;

(iii.) *Nodule Worm* (*Oesophagostomum columbianum*).—Usually no anaemia; loss of condition pronounced; droppings are soft and contain slimy mucus and sometimes streaks of blood; severely affected sheep have humped backs and stiff action of hind legs; tail often held up at an angle. If nodules are present in the rectum they can be detected with the finger. Symptoms are usually seen from late autumn to early spring.

Examination of Droppings.

This is a matter for trained technicians. A single sample is of very little value. Send about ten samples from sheep which are thought to be suffering from parasites and ten from sheep in the same mob but which are thriving. Do not send mixed droppings from several sheep. Collect samples from individual sheep, either by waiting until droppings are passed by the selected sheep, or, preferably, by removing droppings from the rectum with one finger. At least a wooden matchbox full should be collected and should be dispatched at once to the Animal Health Station at Yeerongpilly.

Post-mortem Examination.

Select a sheep which is obviously affected but not one which is about to die. A sheep which has died, or is about to die, is not a good subject, because some of the worms may have died and disintegrated or have been

DESCRIPTION OF PLATE 16 (Page 46).

Region of Tract.	Parasites Found.
1. Gullet (Oesophagus)	..
2. Paunch or 1st Stomach (rumen) ..	..
3. Honeycomb or 2nd Stomach (reticulum)	..
4. Bible or 3rd Stomach (omasum) ..	..
5. Rennet or 4th Stomach (abomasum)..	(*a*) Large Stomach Worm or Barber's Pole Worm (Haemonchus) (*b*) Small Brown Stomach Worm (Ostertagia)
6. Small Intestine or Runners	(*a*) Small Intestinal Worm or Black Scour Worm (Trichostrongylus) (*b*) Tapeworm
7. Blind Gut (caecum)	(*a*) Whipworm (Trichuris)
8. Crown (Colon)	(*a*) Nodule Worm (Oesophagostomum columbianum)
9. Hind or Back Gut (rectum)	..
10. Caul (Omentum)	Tapeworm cysts (Cysticercus tenuicollis)

passed out. For a correct interpretation of a post-mortem examination one must know the normal location of the various parasites, their appearance, and whether the numbers found constitute a serious infestation. For example, 100 nodule worms is a serious infestation in a young sheep, whereas the same number of large stomach worms or small intestinal worms would be harmless to their host.

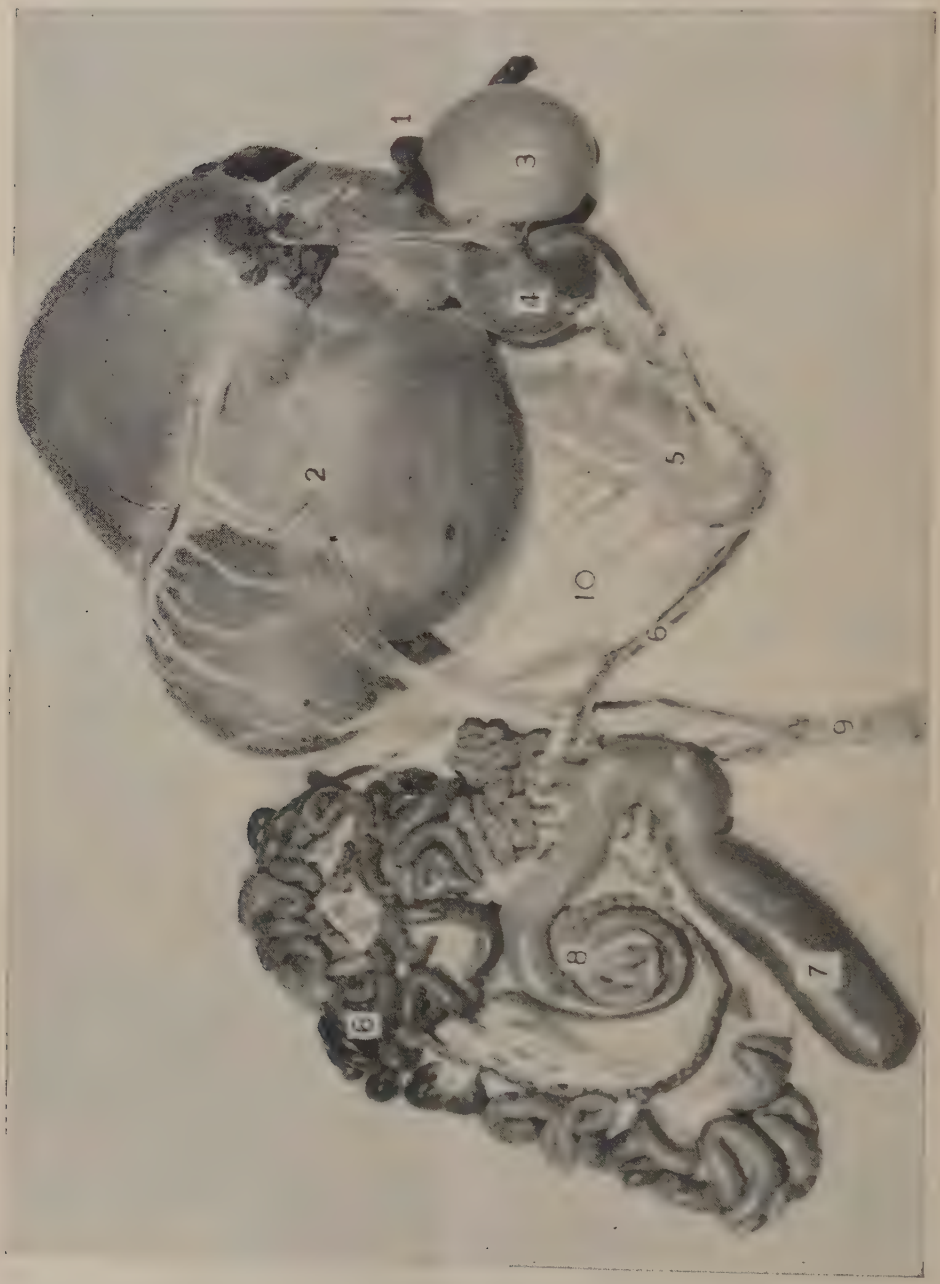


Plate 16.
DIGESTIVE TRACT OF SHEEP SHOWING LOCATION OF WORM PARASITES.

Always consider the state of nutrition in connection with worm infestation: the poorer the feed the fewer worms are necessary to cause disease. Where graziers are not familiar with the anatomy of the sheep and the appearance of the parasites it is best to send the whole of the digestive tract, excepting the paunch but including the liver and lungs, to the laboratory. The material must be packed in 5 per cent. formalin in a sealed tin. Unless preserved, the worms distintegrate rapidly.

The appearance of the digestive tract of the sheep and the location of the various worm parasites is shown in Plate 16.

Importance of a Correct Diagnosis.

It is essential that consideration be given to all the factors which might influence the condition of the sheep before arriving at a final diagnosis. Cases are known where sheep suffering from "fluorosis," a disease in which the teeth wear unevenly at an early age, have exhibited symptoms similar to worm infestation. When conducting post mortems be careful to look at the condition of the back teeth.

METHODS OF CONTROL OTHER THAN DRENCHING.

An attack against worm parasites should be concentrated along three main lines:—(1) killing the worms in the sheep by drenching; (2) killing the eggs and larvae on the ground by allowing sunlight, dryness, and cold to destroy them while the area is spelled from sheep; (3) maintaining the general health and resistance of sheep by means of adequate nutrition.

Why Outbreaks Occur.

In the better rainfall areas practically all sheep harbour worms, yet severe outbreaks of parasitic diseases are relatively uncommon. Disease depends on the number of worms present and the damage they cause. Every worm in a sheep is picked up as a larvae on the pasture; every larva comes from an egg laid by a worm in a sheep. For their development and survival on the ground eggs and larvae must have warmth, moisture, and shelter. Several wet days accompanied by cloudy and humid conditions are necessary. Under very favourable conditions eggs and larvae may live on the ground for many months, but under average conditions a very high proportion of them dies off within three or four weeks.

Spelling and Rotational Grazing.

If sheep are drenched and returned to the same paddock they will begin to pick up infective larvae as soon as they begin to graze, and in a few weeks may be just as heavily infested as before drenching. By moving the sheep to a paddock which has been spelled for three weeks reinfestation is greatly reduced. A system of rotational grazing provides spelled paddocks at all times.

Spelling a paddock for three to four weeks results in the death of most of the worm larvae and this very greatly reduces the risk of heavy infection when sheep are again placed in it. Spelling also permits pasture growth and provides better nutritional conditions. Adequate nutrition builds up and maintains resistance to worms. Spelling is always worth while as a control measure.

Rotational grazing and spelling can be combined conveniently. If there are two paddocks of about equal size, carrying approximately

the same number of sheep, run all of the sheep in one paddock for three to four weeks, then transfer them all to the other paddock which has been spelled meanwhile. Repeat this rotation and spelling.

An even more intensive system can be used under suitable conditions. A four-paddock unit can be used and each paddock stocked in turn for seven days with all the sheep which formerly ran over the whole area of the four paddocks. Each paddock is thus stocked for seven days and spelled for 21 days. In general, a period of about seven days is necessary for the eggs passed in droppings to develop through several stages to that of the infective larvae. By moving sheep every seven days the sheep are ahead of the worms and this together with the 21-day spell should still further reduce the chances of reinfestation.

Rate of Stocking.

Reduction of stocking aids the control of worms by reducing contamination of pastures and making more feed available. Many graziers have found that a reduction of sheep numbers has not resulted in a lower wool cheque but in an actual increase in wool and monetary returns. If the whole property cannot have the stocking rate reduced, reduce the numbers of breeders and young sheep, or else give them more room.

Protecting Young Sheep.

Weaners are most susceptible to worms, and they are often crowded at a relatively high rate of stocking because they are small sheep. Their demands for certain food materials are greater than those for grown sheep—weaners are expected to grow as well as to produce wool, whereas the grown sheep has only to maintain itself and produce wool. Weaners should at all times be provided with adequate feed. The weaner population of a paddock should be kept low. This can be achieved by "cross-weaning" or weaning into a wether mob. If a property is "sheep-to-the-acre" country, aim to have half a weaner and half a grown sheep per acre rather than one weaner per acre. Grown sheep are resistant to worms and do not contaminate pastures heavily. Moreover, they probably destroy many of the larvae which they eat with their feed, whereas the same larvae eaten by a weaner, which is not resistant, will develop into adult worms.

Adequate Nutrition.

Adequate nutrition is of very great value in the control of worms. A well-fed sheep develops and maintains resistance to worms. Grazing crops, improved pastures, spelled pastures, rotational grazing, and conserved feed are all means for maintaining adequate nutrition, and they all diminish the need for drenching.

CONTROL OF THE NODULE WORM.

Special consideration is given to the nodule worm because of its importance as a cause of economic loss to the sheep and wool industry and because of special difficulties in devising methods of control. The distribution of this parasite is shown in Plate 18.

After having been picked up from the grass by the grazing sheep the larval stage of the nodule worm burrows into the wall of both the small and large bowel. Generally, a nodule, like a small abscess, develops and once formed may remain in the bowel throughout the

life of the sheep. The number of nodules is increased every year with the result that more and more of the bowel is affected. In a number of sheep the amount of damage due to nodules is sufficient to interfere with the functions of the bowel. Many sheep properties where nodule worm occurs carry uneconomical animals because of this damage.

CONTROL OF NODULE WORM

Plate 17.

CONTROL OF NODULE WORM.

It is clear that complete control of this parasite will be a matter of several years, for it will not be reduced to negligible importance until all sheep having nodule damage to the bowel are disposed of and replacements have been raised under a control plan.

Control is a matter of killing the adult worms in the large bowel by drenching with phenothiazine at certain times based on knowledge of the life history of the parasite and of the effects of weather and seasonal conditions on its yearly cycle. Plate 17 illustrates some of these points.

The eggs and larvae of the nodule worm on the ground will develop only when there is ample warmth and moisture. Dryness and cold are fatal. The sheep pick up the infective larvae following periods of wet weather during the warmer months of the year, chiefly September to May. The larvae enter the bowel wall and may remain there for a few days, weeks, or even months before returning into the bowel to complete development to adult worms and begin laying eggs to carry on the life-cycle. Larvae in nodules in the bowel wall cannot be killed by drenching. Drenching must therefore be repeated in order to kill the adult worms developing from successive batches of larvae leaving the bowel wall.

The onset of cold weather in May and June largely prevents further development of eggs and larvae on the ground, with the result that very little fresh infestation is picked up by the sheep after the end of May. By the end of August most of the larvae will have completed their sojourn in the bowel wall and will have returned to the large intestine.

With the onset of warmer weather in September the eggs laid by the female worms will be able to develop on the ground and thereby begin the new seasonal cycle of the parasite. Drenching late in August therefore has two objectives—firstly to obtain a maximum destruction of adult worms at a period when there is likely to be a minimum number of larval stages in the bowel wall, and secondly to kill the worms before they have a chance to bring about contamination of spring pastures.

The August treatment of ewes which are to lamb in spring is essential if the lambs are to be protected.

Although the nodule worm is acquired by sheep during the warmer months, it produces its most serious ill-effects during the winter due to the damage caused by the young worms in the bowel wall and the injury caused by the adult worms.

Malnutrition in the winter is aggravated by infestation with nodule worms. A very important aspect of control of this parasite is the provision of adequate feed during the winter. A green grazing crop is particularly useful.

A plan of control should be based on the use of an efficient drench applied at the appropriate times having due regard to the seasonal cycle of the parasite. Phenothiazine is the only drench possessing a high degree of efficiency against the nodule worm. The times for drenching are shown in Plates 15 and 17. The late autumn treatment will remove adult worms already present in the large bowel and will thereby provide the sheep with a better start for the winter. The mid-winter drench is necessary in districts where nodule worms are causing severe ill-effects. The special importance of the late August drench has been discussed already.

Regular treatments along these lines will, after two or three years, go far towards reducing the nodule worm to harmless levels. The control programme can be hastened and made more effective by adopting certain changes in management.

The more important procedures are, where possible, provision of green grazing crops to supplement winter feed, and the adoption of a system of spelling and rotational grazing so that following the three

Plate 18.

DISTRIBUTION OF NODULE WORM.

key drenchings the treated sheep can be moved into paddocks which have been spelled from sheep for a month. (Horses and cattle, which do not harbour the sheep nodule worm, can remain in such paddocks while being spelled from sheep.)

A simple system of rotational grazing and spelling is described on page 47.

WORMS IN THE WEST—WORMS AND DROUGHT.

The regional occurrence of worm parasites is controlled chiefly by weather conditions, particularly rainfall. The eggs and larvae on the ground must have moisture for their development and survival. The building up of heavy infestations depends to a great extent on the rate of stocking. The lighter the stocking the smaller the chances of a sheep picking up worm larvae.

In the far west weather conditions and the low rate of stocking keep the worm burden very light. The effects of exposure on eggs and larvae account for differences in the occurrence of worm infestation between open downs country and scrub country.

Worms do occur in the west, usually in very small numbers. Special conditions are required before the parasites are enabled to increase to dangerous levels.

A series of unusual seasons—for example, two or three "wet" seasons in succession—may be followed by outbreaks of worm infestation. Usually it is the large stomach worm which causes trouble, for this parasite, because of its very high rate of egg production (5,000 per female per day), is able to multiply more rapidly than the others. A single "wet" season is generally insufficient, for when the parasites have to begin from the very small numbers which usually occur in the west it takes some time to build up heavy infestations.

Overcrowding of sheep is likely to result in a building up of infestations. In the areas of low stocking such overcrowding is generally of a local nature; for example, sheep crowding on areas of fresh feed on frontages, in gilgais, and on watercourses, or congregating round watering places. Any situation which is overcrowded and thereby heavily contaminated with droppings and the accompanying worm eggs is a "danger area." When a "danger area" is protected by shade or by being located in a low-lying place, the worm eggs and larvae will find suitable conditions for development and survival and the high rate of stocking on the area will lead to building up of the worm burden of the sheep.

Recognition of these two important features:—(1) a series of "wet" seasons and (2) local overcrowding, will enable the application of appropriate control measures in good time before the worms have caused trouble.

Where do the worms go in the dry times? Without moisture and shelter the eggs and larvae on the ground soon die, but the worms in the sheep host live on for months, even for a year or more, and they keep on laying eggs. The sheep is the reservoir of infection.

In regions which have suffered severe drought the sheep which survive will be in very low condition, and they will have practically no resistance to worm infestation. If good drought-breaking rains come, and feed begins to grow quickly, the sheep will recover quickly too,

and will soon overcome any worm parasites which may have established themselves. However, if the rains are not sufficient to bring a rapid growth of good feed, the sheep will not recover quickly, and may not resist worms picked up as a result of the wet weather.

Even under drought conditions there are certain places which may be dangerous from the point of view of worm infestation. Any place where sheep are crowded together, and which provides shelter and moisture from worm eggs and larvae in droppings, is dangerous. Watering places, feeding grounds (if sheep are being fed on the ground), feeding troughs and camps, may all have actual or potential dangers. Board troughs with earth bottoms can be very dangerous, but if they are situated in open sunlight probably very few larvae will develop in the droppings which collect in and around them. When bag troughs sag and make contact with the ground, droppings can bank up underneath in a sheltered situation which may permit larvae to develop. Such larvae could then crawl through the sacking into the feed.

Feeding grounds are specially dangerous when rain comes, and it is wise to move to a new area after any fall of rain sufficient to wet the soil for an inch or so.

In drought time when the nutrition of the sheep has suffered, there will be less resistance to the effects of worms. A degree of infestation, which in normal times would not be of much consequence, may in drought time be very important. It is, therefore a wise precaution to drench sheep as soon as it is evident that they are losing condition because of a shortage of feed.

SUMMARY.

Drenching is expensive and is an attack on only half of the problem of control of worm parasites.

Prevention of outbreaks by strategic drenching and management is the aim of control measures.

If the sheep is well fed all the time and treated with the right drench at the right time parasites will not cause losses.

Phenothiazine has provided a new outlook on control of parasites because it has tremendous "preventive" value, but it should not be used indiscriminately; other and cheaper drenches are still effective in their proper time and place.

The Large Stomach Worm.

1. The large stomach worm is a summer parasite most prevalent in spring, summer, and early autumn.

2. Risk of infection is increased by a fall of 40-50 points of rain followed by some days of dull, humid weather.

3. Treat sheep about three weeks after such periods, and if dull, rainy weather persist for some weeks, repeat treatments at three-week intervals until dry or cold weather returns.

The Nodule Worm.

1. Infestation is picked up in spring, summer, and early autumn, but effects may not be seen until winter.

2. Treat breeding ewes late in August. This will reduce risk of spring lambs becoming infested.

3. Treat young sheep in autumn to prevent disease in early winter.

4. Treat all sheep in winter (June-July).

5. Use Phenothiazine.

The Small Intestinal Worm.

1. This is a parasite of the cooler months, and infection occurs in late autumn, winter, or early spring.

2. Severe infections occur after a wet autumn, followed by a dry winter, or a wet winter followed by a dry spring.

3. Treat lambs at weaning time, whether thriving or not, particularly spring lambs weaned in the autumn.

4. Treat young sheep at four to five-week intervals from autumn until spring feed comes away, particularly when winter is either dry or very wet.

5. Treat ewes two months and one month before lambing is due. This will reduce infection of the lambs.

Management of Stock to Prevent Outbreaks of Severe Worm Infestation.

1. Overstocking leads to heavy contamination of pastures with worm eggs.

2. Overstocking may be general over the whole paddock, or may be localised—for example, in gullies, frontages, &c., when the remainder of the paddock is bare or dry.

3. Guard against general overstocking by keeping numbers down, especially young sheep and breeders.

4. Look for evidence of local overstocking, and when observed drench the sheep.

5. Risk of infection may be reduced by rotational grazing and spelling of paddocks.

6. Where there are two paddocks of about the same size, carrying about the same number of sheep, run all the sheep in one paddock for three or four weeks, then move them all to the other paddock which has been spelled meanwhile.

7. This can be repeated: it can become the usual method of stocking. It is the simplest method of providing spelled paddocks.

General.

1. Drench ewes before lambing, and young sheep whenever conditions as outlined above are likely to expose them to risk of infection.

2. Find out which kinds of worms are responsible for trouble and use the appropriate drench.

3. Your sheep and wool adviser, stock inspector, or district veterinary officer will help you—consult him.

MARKETING

Production Trends—June.

Throughout the dairying districts splendid rains were received during June. Pastures generally are in good condition, and the dairying industry seems assured of one of the best winter seasons for many years. During the past year butter and cheese production in Queensland show a substantial increase on production for the previous year. The following table shows total production for the year, July to June, 1946-47, in comparison with the estimated total production for the year, July to June, 1947-48.

Year.	Butter.	Cheese.
	tons.	tons.
1946-47	33,079	7,719
1947-48	46,246	9,651

On the Darling Downs sowing of the wheat crop is now nearing completion. It is expected that the total area sown will be approximately 15 per cent. in excess of that for the previous season, and will reach at least 550,000 acres. Barley and oat crops are making good growth. The acreage of barley planted is estimated to be 12,000 to 15,000 acres.

Harvesting of the maize crop throughout Queensland is well under way. Total State production will be considerably less than normal, and may approximate 2,000,000 bushels.

Harvesting of the grain sorghum crop is still in progress in some districts. Total production for the State is estimated at 850,000 bushels.

In the peanut-growing areas harvesting of the crop is in progress. Estimates of production have been difficult in all districts owing to damage caused by rain and mice, and variable reports have been received. It seems, however, that the State production will not reach 20,000 tons, and may possibly be down to 16,000-18,000 tons.

During June the dry conditions experienced throughout the northern and north-western pastoral areas of the State showed no abatement, and stock are being removed wherever practicable for agistment purposes. Unless relief rains are forthcoming at an early date, stock losses are expected to increase considerably in such areas. Elsewhere stock are in good condition, and feed and water supplies are ample for the time being at least.

The Tobacco Leaf Marketing Board.

An Order in Council has been issued under the *Primary Producers' Organisation and Marketing Acts* constituting a marketing board for tobacco leaf produced in Queensland for a period of three years from 22nd July, 1948.

The Board consists of four growers' representatives, namely, Messrs. T. V. Gilmore (Mareeba), E. H. Short (Dimbulah), J. P. Power (South Brisbane), and R. Ziviani (Inglewood), together with the Director of Marketing.

Messrs. Gilmore and Short were elected unopposed for District No. 1, comprising all that part of Queensland lying north of the Tropic of Capricorn, whilst Messrs. Power and Ziviani were the successful candidates at the election for District No. 2, comprising all that part of the State lying south of the Tropic.

It is expected that the Tobacco Leaf Marketing Board will assume its marketing functions after the termination of the present Commonwealth-wide scheme of marketing under the National Security (Australian Tobacco Leaf) Regulations on 31st December next.

The Potato Marketing Board.

The Queensland Potato Marketing Board at its meeting held on 8th July, 1948, dealt extensively with matters of administration which will be given effect to in the near future.

Applications are being called for the position of Manager of the Board, and an early appointment will be made to enable the Board to take control of the marketing of the spring crop without any hitch. With the ceasing of control the contract system will disappear, and in future any producer may plant potatoes and will be required to deliver crops to the Board for marketing. This also applies to intending new growers. The duties of the new appointee will be to make an immediate survey of the crop position and despatch a query to all growers relative to their probable acreage during the next harvest.

Publicity will be given to the Board's requirements in this respect so that new growers may contact the Board in order to supply fully any information required.

CURRENT FEEDING VALUES FOR MONTH OF JUNE, 1948.

(Division of Animal Industry and Division of Marketing.)

Feed.	Starch Equivalent Value per 100lb.	Protein Value per 100lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks
				d.	
STARCH CONCENTRATES.					
Wheat	72	8	7s. 7d. bushel	2·11	Light supplies of sorghum were available early in the month. Deliveries have fallen off considerably.
Wheat meal ..	72	8	£14 13s. 4d. short ton	2·44	
Maize	78	8	7s. 7½d. bushel	2·09	
Maize meal ..	71	8	£15 0s. 0d. short ton	2·53	
Sorghum ..	71	7	£12 15s. 0d. ton	1·92	
Sorghum meal ..	71	7	£13 0s. 0d. short ton	2·19	
Barley	71	7	Not quoted		
Barley meal ..	71	7			
Oats	62	8	5s. 9d. bushel	2·78	
Crushed oats ..	62	8	5s. 11d. bushel	2·87	
Pollard	66	10	Not quoted		
Bran	56	10			
Molasses ..	50	1	47s. 6d. 44-gal. drum	2·59	
PROTEIN CONCENTRATES.					
Meat meal ..	80	55	Not available		
Linseed meal ..	72	25			
Peanut meal ..	78	43			
Blood meal ..	63	68			
Cottonseed meal	67	33			
ROUGHAGES.					
Lucerne hay and chaff	40	10	Hay £7 15s. 0d. ton	2·07	Wheaten chaff is in very light supply.
			Chaff £11 15s. 0d. ton	3·14	
Oaten hay ..	33	3	£9 0s. 0d. ton	2·92	
Wheaten hay ..	33	3	Not available		
Oaten chaff ..	40	3	£10 10s. 0d. ton	2·81	
Wheaten chaff ..	40	3	£7 5s. 0d. ton	1·94	
MINERAL SUPPLEMENTS.					
Ground calcium carbonate (limestone)			Not quoted		
Bone meal			£11 0s. 0d. ton	(11s. 2d. per 100 lb.)	
Bone flour			Not quoted		
Shell grit (dicalcic phosphate) ..			4s. 0d. bag		

GADGETS AND WRINKLES

A DIBBER ON WHEELS.

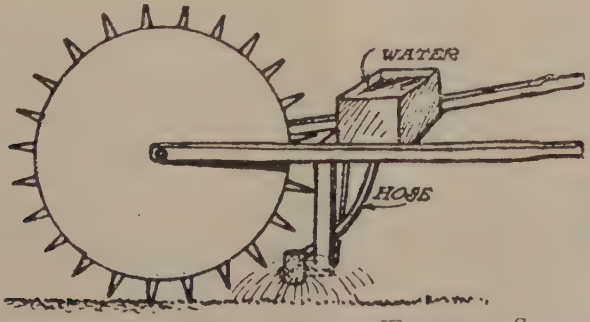
The owner of a gardening business says that he has had to transplant many small plants every year. For days he has worked on his knees making holes for them with a hand dibber. He has grown acres of celery, and at first he knew no better way than to make the holes, then, if setting in a dry time, to pour in water by hand. It occurred to him when pressing the dibber into the soil that if the dibber were on the outside of a weighted wheel with handles like a wheelbarrow, it could drive the dibbers into the soil as effectively as by hand. He made some experiments and found that the idea worked out as he had expected.

A wheel about two feet in diameter was made of boards, with holes bored around the outside about six inches apart, and with pegs made of hardwood driven in the holes so as to extend four inches from the outside of the wheel. The wheel was three inches thick, which left room for two bands of hoopiron around the outside of the wheel with the pegs or dibbers in the middle between them.

He still had to apply the water by hand, however, and as the wheel needed more weight the idea came to him to make a water-tight box, place it on the handles of his wheel and carry the water with a piece of hose to carry the water down. To prevent washing the ground and filling the holes, the hose emptied into a small tin can perforated at the bottom, so that the water fell gently to the ground like rain. This can was attached to a piece of wood fastened to the handles and extending down to about two inches from the ground. A water tap in the box regulated the amount of water in the hose.

This simple and cheaply made device was so satisfactory that, with the help of a carpenter, he made a machine with two wheels that looked like a push cart. The plan was about the same, but it did double the work. This machine marked the ground, made holes for plants, and put the water in them as fast as it was drawn over the ground. He sometimes used water with a solution of fertilizer in it.

This machinery was used very effectively for transplanting many acres of celery, and worked equally well for all small plants, as onion sets or bulbs of any kind, lettuce, small cabbage plants or any plant that required planting at regular distances apart.



A Dibber that Makes the Holes and Waters the Ground.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

WHAT CAN BE DONE FOR THE HANDICAPPED BABY.

Most Babies are Normal.

HAVE you ever thought how wonderful it is that out of the thousands of babies born every year in every country in the world the great majority are physically and mentally perfect. The complicated organism that is a human being usually comes into the world with every organ and sense in absolute working order.

But just occasionally—because, probably, of some maternal condition which retards or arrests the baby's development before birth—there is a flaw somewhere. Maybe just a small one—a slightly twisted foot, "hammer toes," weakness of heart action or sight or hearing, which may set the child back as he grows older. Some babies take a longer time than usual in learning to do things or notice things.

If a mother is attending a maternal and child welfare centre the sisters, who handle thousands of babies every year, will quickly recognize any defect and advise her where she can go to have it attended to.

For the benefit of mothers who are unable to attend a centre or have their babies examined by a doctor, the average progress of development is outlined.

What Should a Baby's Progress be.

Lest any mother be needlessly anxious about the progress of her baby, it is well to understand that children differ in regard to the ages at which they reach the various stages of development. On an average, most babies are able to hold up their heads about the age of three months, and at about six months they are learning to sit up; although they may be eight or nine months old before they can sit without some support, particularly if they are big fat babies. By the ninth or tenth month, most babies can crawl and by eleven or twelve months can stand by holding on to a chair or the side of the play pen. Between twelve and fifteen months they learn to walk alone.

In regard to both cutting teeth and talking there is considerable variation in the rate of development. The first tooth may be cut at six or seven months, and six teeth may be present at twelve months. The cutting of the first tooth may be delayed until nine months or later, and then be quickly followed by the others.

A baby may utter single syllables at the age of nine months and single words at twelve months. A few are slow in learning to speak, although mothers notice that they can understand quite well what is said to them.

Deformities or Delayed Development.

It is *most important* that these should be recognized early so that the cause may be investigated. Parents *should realise their responsibility* in this regard. The treatment of bony defects or deformities should be carried out quite soon after the baby is born and while the bones are soft and pliable; when this is done they can usually be corrected completely. Even serious deformities can be helped considerably by doctors who specialize in this branch of medical science. It is cruel to allow a child to be handicapped all his life for the want of early attention to his defect or deformity. If specialist attention is needed and country parents are unable to afford the expense of coming to Brisbane for it, *The Maternal and Child Welfare Service* may be approached and the circumstances stated.

Even the mentally handicapped child may be assisted towards a more satisfactory life if the parents obtain specialist advice while he is young. Parents should never allow a child a remain untreated because they think "poor baby is crippled or not normal and it cannot be helped." *The Maternal and Child Welfare Service* was established to help every parent with every baby and child up to school age. Something can be done for every child normal or otherwise. Call or write with your problem giving full particulars.

Any further advice on this and other matters connected with children may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Recipes Worth Trying.

Danish Tripe.

Take a piece of tripe large enough to fold over. Make a stuffing of onions, a little sage, bread crumbs, salt and pepper. Put a thick layer of this on the tripe. Fold together so that the stuffing will not be lost and sew together with string. Put in a greased baking dish. Cover with several slices of butter, dripping would do, cover with a buttered paper and bake slowly for about an hour.

When cooked make a brown gravy of the juice in the pan and serve over the tripe. Parsley and mashed potatoes could be served with it.

Savoury Patties from the Oven.

Ingredients: About 3 oz. cooked meat scraps, three rashers of bacon (or any ham or pork scraps), quarter loaf stale wholemeal bread soaked in a little milk or water, and then pressed dry; one cup cold mashed potatoes, one dessertspoon chopped parsley, a pinch of fresh thyme or marjoram, one dessertspoon tomato sauce or ketchup, salt and pepper to taste.

Mince the pieces of meat and bacon, and then mix all ingredients thoroughly together, moistening with a little milk if necessary, or with a beaten egg. The mixture should be stiff enough to hold together in little individual patties. Form these into rissole shapes, place in meat dish, and bake with a little dripping in a fairly hot oven for about 20 minutes. Serve with gravy and vegetables.

Minty Potato Soup.

Ingredients: 1 oz. fat, finely sliced onion, 1½ lb. potatoes, 2 pints stock, ½ to ¾ pint milk (optional), 1 teaspoon cornflour, salt and pepper, 1 to 2 level tablespoons freshly chopped mint.

Melt the fat in a saucepan and fry onion gently for a few minutes without browning. Prepare and slice potatoes, add to pan and continue frying for a few minutes longer. Add the two pints of liquid and a little seasoning and cook gently for about ¾ hour. Rub all through a sieve, or mash well together and return to pan. Mix the cornflour smoothly with a little cold water, stir into the soup and simmer for a few minutes, stirring all the time. Add the milk, if used, and thin soup down with a little hot liquid if necessary. Adjust seasoning, make quite hot and sprinkle in the mint.

QUEENSLAND WEATHER IN JUNE.

During the month the South Coast, Darling Downs and Maranoa Divisions all recorded above average rainfalls, which supplemented the excellent falls received in these areas during May. The Warrego and Far South-West Divisions also received above normal totals, which should supplement rains in the early months of the year and ensure adequate winter feed for pastoralists. In all other divisions, with the exception of the North Coast Barron, general rainfall distribution was below normal, although in parts of the Central Highlands and Lowlands above average totals were registered at many places, this being the first useful rain since March. However, whilst these rains will provide some immediate relief in these latter areas, further rain will be required in the near future in order to consolidate any benefits received. In other inland areas, viz. the Carpentaria and Western Divisions and parts of the Central Lowlands, the dry spell continues and prospects are not good for the coming colder portion of the winter period.

The main contribution to the over average rainfall dstribution in the above-mentioned areas occurred chiefly in the rain spell from the 14th to 16th, during which period the following regions received the amounts indicated:—Maranoa and Western Darling Downs 1½ to 2 inches; South Coast Port Curtis and northern portion of South Coast Moreton 2 to 4 inches; eastern Darling Downs and southern portion of South Coast Moreton 6 to 16 inches. The remainder of the month's rainfall occurred in the southern border divisions and coastal divisions from 7th to 12th and 22nd to 23rd, when scattered light to moderate falls were registered.

Floods.—As a result of the rain spell from the 14th to 16th, many places in the South Coast, Moreton and eastern Darling Downs Divisions received heavy to local flood fall amounts. The heaviest aggregates for the period were Springbrook 1,659, Nerang 1,382, Coolangatta 1,255, Southport 1,252, Tallebudgera 1,175, and Mount Tamborine 1,133 points. The heaviest 24 hourly totals were reported on 15th from Nerang 1,137, Mount Tamborine 907, Tallebudgera 890, Southport 864, and Sandgate 825. Low level flooding occurred in the coastal area south from Brisbane to the border, along the catchments of the Mary, Pine, Brisbane, Logan, Coomera and Nerang Rivers, and resulted in considerable damage to crops, roads, communication systems, premises and in suspension of road and rail transport. Some wheat plantings were affected on the Darling Downs and in a few cases these were a total loss. In the Downs area local flooding also was reported along the Condamine River basin. Millmerran was isolated until after 18th and traffic approaches to Dalby were also cut off. The lower reaches of the Condamine River were still carrying considerable run off and rising slowly at the end of the month. Flooding was heaviest in the South Coast border areas adjacent to the northern rivers districts of New South Wales where damage was estimated to exceed £250,000.

Temperature.—Maximum temperatures were slightly above normal in the Peninsula and all inland areas, except in Maranoa and Far South-West Divisions. The coastal areas recorded below average reading. Cloncurry 0.7 deg. above normal and Palmerville 0.8 deg. above normal had the highest averages, while Cairns 2.2 deg. below normal and Thargomindah 1.7 deg. below had the lowest average. Maximum temperatures were above normal in the Georgetown, Cairns, Longreach, Thargomindah, and Mitchell areas, but below normal in other districts ranging from 2.1 deg. above at Longreach to 3.3 deg. below at Camooweal. Due to the persistent tropical dip influences during the month, frost activity was not as frequent or as heavy as they were during May, and occurred principally during the early and latter parts of the month. The centres in which most frosts occurred were Stanthorpe 14 nights (21 deg. screen and 12 deg. grass 29th); Kingaroy 13 nights (25 deg. screen and 17 deg. grass on 29th and 30th); Toowoomba 11 nights (27 deg. screen, 17 deg. grass on 29th).

The rain position is summarised below:—

Divisions.	Normal Mean.	Mean June, 1948.	Departure from Normal
	Points.	Points.	Per. Cent
Peninsula North	58	16	72 below
Peninsula South	45	3	93 "
Lower Carpentaria	51	4	92 "
Upper Carpentaria	83	22	73 "
North Coast, Barron	205	255	24 above
North Coast, Herbert	285	234	18 below
Central Coast, East	197	119	40 "
Central Coast, West	130	29	78 "
Central Highlands	159	158	1 "
Central Lowlands	117	86	26 "
Upper Western	67	9	7 "
Lower Western	73	20	73 "
South Coast, Port Curtis	251	297	18 above
South Coast, Moreton	297	797	168 "
Darling Downs, East	183	589	222 "
Darling Downs, West	156	353	122 "
Maranoa	158	236	49 "
Warrego	134	187	39 "
Far South-West	101	118	17 "

Commonwealth of Australia, Meteorological Bureau, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JUNE RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of years' records.	June, 1947.	June, 1948.		June.	No. of years' records.	June, 1947.	June, 1948.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	1·73	42	2·45	3·25	Caboolture	2·74	67	0·27	5·85
Cairns	2·89	61	3·76	4·06	Childers	2·40	48	0·17	5·44
Cardwell	2·09	71	1·38	2·24	Crohamhurst	4·29	50	0·37	8·70
Cooktown	2·06	67	2·14	1·65	Esk	2·14	56	0·11	3·41
Herberton	1·18	57	1·42	1·94	Gatton College	1·72	44	0·63	..
Ingham	2·46	51	1·66	3·12	Gayndah	1·82	72	0·03	2·91
Innisfail	7·41	62	8·71	6·02	Gympie	2·60	73	0·56	5·13
Mossman	2·97	19	4·82	3·23	Kilkivan	2·14	62	0·42	3·39
Townsville	1·38	72	0·17	0·11	Maryborough	2·93	72	0·29	5·21
					Nambour	3·69	47	0·31	5·86
Central Coast.					Nanango	1·95	61	0·44	2·45
Ayr	1·48	56	0·16	0·26	Rockhampton	2·51	72	0·07	1·92
Bowen	1·64	72	0·24	1·24	Woodford	2·78	55	0·33	5·74
Charters Towers	1·31	61	0·09	0·25					
Mackay	2·74	72	1·03	2·51	*Darling Downs.*				
Proserpine	3·22	40	1·03	2·43	Dalby	1·63	73	0·90	3·42
St. Lawrence	2·46	72	0 02	1·73	Emu Vale	1·45	47	0·44	6·72
					Jimbour	1·53	64	0·64	2·99
Central Highlands.					Miles	1·69	58	0·20	3·84
Clermont	1·68	72	0·00	0·53	Stanthorpe	1·88	70	0·67	7·53
Springsure	1·76	74	0.00	1·52	Toowoomba	2·33	71	0·94	7·13
					Warwick	1·70	78	0·58	6·43
South Coast.									
Biggenden	2·16	44	0·20	2·33	*Maranoa.*				
Bundaberg	2·79	60	0·20	4·67	Roma	1·49	69	0·25	1·80
Brisbane Bureau	2·54	96	0·29	8·83	St. George	1·49	62	0·46	2·87

CLIMATOLOGICAL DATA FOR JUNE.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	77	64	80	6, 8, 21	53	19	406	15
Herberton	..	69	51	78	20	37	24	194	14
Townsville	..	78	58	82	22	49	29	11	1
Rockhampton	30·11	74	53	80	22	41	29	192	5
Brisbane	30·18	69	51	77	20	42	29	883	10
Darling Downs.									
Dalby	..	67	43	75	21	26	28, 29, 30	342	5
Stanthorpe	..	61	37	68	11, 12	21	29	753	9
Toowoomba	..	62	43	70	2, 20	27	29	713	9
Mid-Interior.									
Georgetown	..	82	56	86	3, 6, 8, 9, 20	..	..	3	1
Longreach	30·19	75	49	86	21	37	30	81	1
Mitchell	30·19	66	41	78	20	26	28	220	4
Western.									
Burketown	..	83	55	88	4, 20, 22	43	29	Nil	..
Boulia	30·08	74	45	87	6	34	29, 30	Nil	..
Thargomindah	30·21	65	45	80	6	35	29, 30	195	5

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	17	41	Longreach	29	40
6	6.27	5.21	Charleville ..	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry	41	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5.28	Dirranbandi ..	21	17	Townsville ..	15	35
26	6.10	5.31	Emerald	14	24	Winton	33	47
31	6.4	5.33	Hughenden ..	26	44	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	2.27	12.59
2	3.32	1.54
3	4.37	2.57
4	5.38	4.07
5	6.33	5.19
6	7.21	6.31
7	8.02	7.41
8	8.40	8.48
9	9.15	9.52
10	9.49	10.55
11	10.24	11.58
12	11.02	..
		a.m.
13	11.43	1.00
	p.m.	
14	12.28	2.01
15	1.18	2.59
16	2.11	3.52
17	3.06	4.42
18	4.03	5.26
19	4.58	6.04
20	5.53	6.39
21	6.45	7.09
22	7.37	7.38
23	8.29	8.05
24	9.22	8.33
25	10.16	9.02
26	11.13	9.34
27	..	10.09
	a.m.	
28	12.14	10.51
29	1.17	11.40
		p.m.
30	2.20	12.38
31	3.22	1.43

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17 Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	11	29	26	44	0	20	28	52
6	13	25	28	41	3	16	31	47
11	24	13	41	28	16	3	47	32
16	30	9	46	24	21	0	53	26
21	23	15	39	30	14	6	44	35
26	13	25	28	41	3	16	31	48
31	9	30	25	45	0	21	26	53

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	7	52	36	65	20	50	7	44
3	3	55	34	67	18	52	4	45
5	6	48	35	62	20	48	6	40
7	19	37	42	56	27	41	17	32
9	30	24	51	46	35	32	25	21
11	42	13	58	39	43	24	35	13
13	51	8	65	36	49	21	42	8
15	55	3	68	32	51	18	45	4
17	54	3	67	32	51	18	44	4
19	46	9	62	36	47	22	38	9
21	37	19	55	43	40	28	31	17
23	27	28	49	49	33	34	23	24
25	18	38	42	56	27	41	16	33
27	8	47	36	62	21	47	8	39
29	5	51	35	64	19	50	5	43
31	3	55	34	67	18	52	4	45

Phases of the Moon.—New Moon, August 5th, 2.13 p.m.; First Quarter, August 12th, 5.40 a.m.; Full Moon, August 20th, 3.32 a.m.; Last Quarter, August 28th, 4.46 a.m.

On August 15th, the Sun will rise and set about 17 degrees north of true east and true west respectively, and on August 9th and 23rd, the Moon will rise and set approximately at true east and true west respectively.

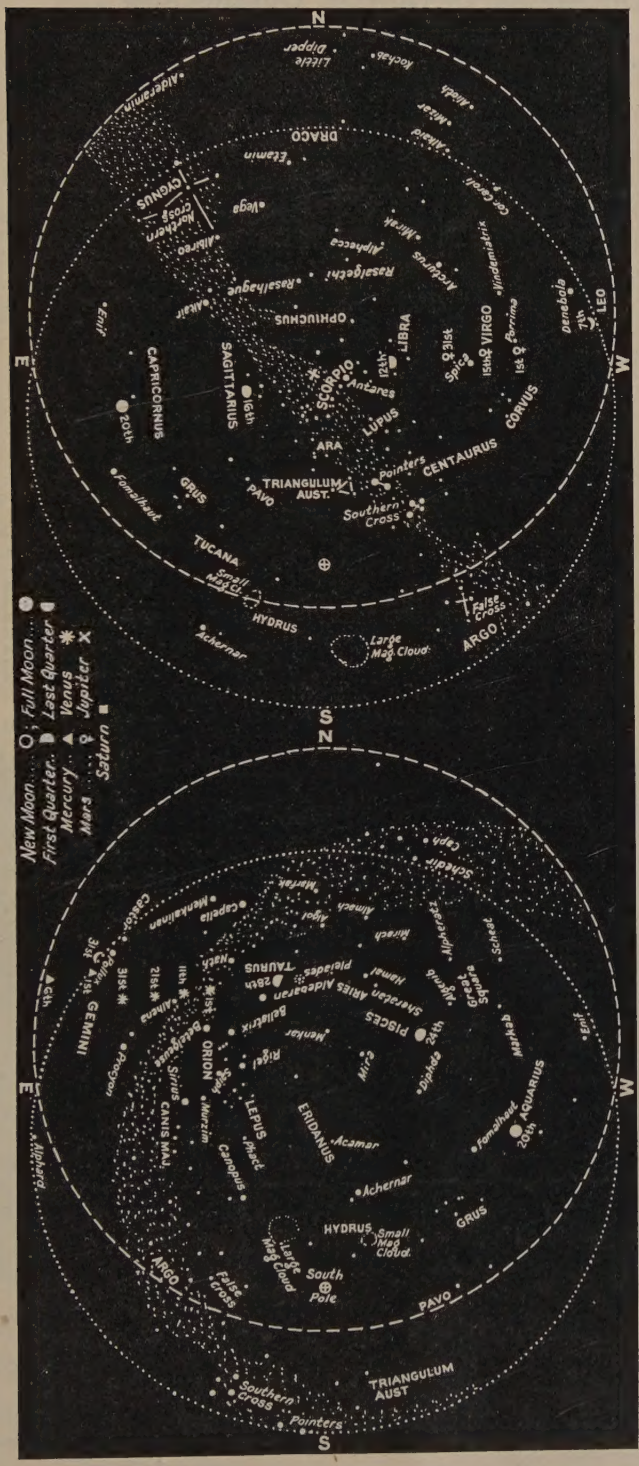
Mercury.—In the constellation of Gemini at the beginning of August and will then rise about 40 minutes before the Sun. It will be in line with the Sun on the 11th and at the end of the month, in the constellation of Vergo, will set 1¼ hours after the Sun.

Venus.—In the constellation of Gemini. On the 1st will rise between 3.30 a.m. and 4.30 a.m. and at the end of the month between 3.15 a.m. and 4.15 a.m.

Mars.—In the constellation of Vergo, at the beginning of the month will set between 9.50 p.m. and 10.50 p.m. On the 22nd it will pass 2 degrees to the north of Spica and at the end of the month will set between 9.15 p.m. and 10.30 p.m.

Jupiter.—Now rising about mid-day and almost overhead by nightfall. On the 1st it will set between 3.15 a.m. and 4.15 a.m., and by the end of the month between 1 a.m. and 2.15 a.m.

Saturn.—Now too close to the Sun for observation, being in line with the Sun on the 19th.



Star Charts.—The chart on the right is for 7.15 p.m., in the south-east corner of Queensland, to 8.15 p.m. along the Northern Territory border on the 15th August. (For every degree of longitude we go west, the time increases by 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month, the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the Moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

ASTRONOMICAL DATA FOR QUEENSLAND.

SEPTEMBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.3	5.33	Cairns	27	31	Longreach	34	36
6	5.58	5.36	Charleville	27	27	Quilpie	35	35
11	5.52	5.38	Cloncurry	48	52	Rockhampton ..	9	11
16	5.46	5.40	Cunnamulla ..	29	29	Roma	17	17
21	5.40	5.42	Dirranbandi ..	19	19	Townsville	22	27
26	5.35	5.45	Emerald	18	20	Winton	38	42
30	5.30	5.46	Hughenden ..	33	37	Warwick	3	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	4.18	2.53
2	5.08	4.06
3	5.53	5.17
4	6.33	6.26
5	7.09	7.33
6	7.44	8.39
7	8.21	9.44
8	8.58	10.48
9	9.39	11.52
10	10.23	..
		a.m.
11	11.12	12.53
	p.m.	
12	12.05	1.49
13	1.00	2.40
14	1.56	3.26
15	2.52	4.05
16	3.47	4.41
17	4.40	5.12
18	5.33	5.41
19	6.25	6.09
20	7.18	6.36
21	8.12	7.05
22	9.08	7.35
23	10.07	8.09
24	11.08	8.48
25	..	9.34
	a.m.	
26	12.10	10.27
27	1.11	11.27
		p.m.
28	2.07	12.34
29	2.58	1.43
30	3.44	2.53

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	29	26	44	0	19	28	52
6	21	15	37	31	12	7	43	35
11	30	9	46	24	21	0	53	26
16	25	13	42	28	16	2	48	31
21	14	23	30	39	5	14	34	44
26	9	30	25	45	0	21	26	53
30	13	25	28	41	3	16	31	48

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	6	51	35	64	20	50	6	43
3	16	39	41	57	26	42	14	34
5	27	27	49	48	33	33	23	23
7	40	15	57	41	42	26	33	14
9	50	6	64	34	48	20	41	7
11	55	3	68	32	51	18	45	4
13	55	3	68	32	51	18	45	4
15	47	8	63	36	47	21	39	8
17	39	17	56	42	41	27	33	16
19	29	26	50	47	35	33	25	22
21	19	37	42	56	27	41	17	32
23	9	46	37	61	21	47	8	38
25	3	53	34	66	18	51	4	44
27	2	56	33	67	17	53	3	46
29	8	48	36	62	21	48	8	40
30	13	43	39	59	24	45	12	36

Phases of the Moon.—New Moon, September 3rd, 9.21 p.m.; First Quarter, September 10th, 5.05 p.m.; Full Moon, September 18th, 7.43 p.m.; Last Quarter, September 26th, 3.07 p.m.